AUGUST 1958

# the Airman

OFFICIAL JOURNAL OF THE AIR FORCE

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# the Airman

OFFICIAL JOURNAL OF THE AIR FORCE

VOLUME II, NUMBER 7 AUGUST 1958



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Office of the Secretary of the Air Force
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## IN THIS ISSUE

THE AIRMAN is one year old this month. Like most yearlings, it has only recently developed its character and personality. How these traits harden into maturity depends upon the readers. THE AIRMAN is young enough to be flexible, and old enough to have made an impression. The staff can only determine whether the impression is good or bad by letters from you, the readers. So far, you indicate we are on the right road. If you disagree, let us know.

*And remember,* THE AIRMAN'S *success depends upon contributions from individuals, units, bases, and commands!*

☆ ☆ ☆

The North American Air Defense Command will be one year old next month. Its growth defies genetic description. The story of this mammoth defensive force begins on page 4. Incidentally, this month's cover is an adaptation of a composite painting by Craig Shafer, a young artist with the NORAD Headquarters' Audio-Visual Services. It embodies the spirit of NORAD—the weapons of defense against the skies of the Arctic.

☆ ☆ ☆

*Not by a Single Bound,* which begins on page 11, is the first installment of a three-part story we believe to be the first complete roundup of Air Force efforts to solve the many physiological problems barring man's entry into space. The story describes the problems and relates the status of aeromedicine's work on each.


USAF PERIODICAL 30-15

SUBSCRIPTIONS

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Editorial Office: THE AIRMAN, Room 2-206 Tempo E, 4th and Adams Drive SW, Washington 25, D. C. Telephone: LIberty 5-6700, Ext. 67393.

THE AIRMAN is primarily a medium for the exchange of ideas and information among Air Force personnel. Readers are encouraged to submit articles, short subjects, photographs and artwork. All contributions will be given consideration; suggestions and criticisms are welcomed. Opinions expressed by individual contributors do not necessarily reflect the official viewpoint of the Department of the Air Force. All photographs are official USAF photos unless otherwise designated.

Use of funds for printing this publication approved by the Secretary of the Air Force and the Director of the Bureau of the Budget July 5, 1956.

# Letters to the Editor

### "LITTLE DOLL"

Sir: *Your article,* Dual Gift, *page 33, March-April issue of* THE AIRMAN *made reference to the* ever lovin' *P-26. I was in the Philippines in December 1941, when war broke out and have some additional information you may be able to use.*

*The Philippine Air Force was using the "Little Doll" as its firstline fighter at the time. A few days after war started, they were landing them at Clark Air Base for servicing. Having lost the B-17D I was crew chief on, I was assigned to this duty for transient fighters of all types. The one ship I remember very well was flown by Capt. Jessie Villamore, only Philippine ace during WW II.*

*He would land his P-26 and before the prop had stopped turning over he would start yelling for gas and ammunition. He was a real tiger.*

*Thanks for printing such reminders of yesteryear in* THE AIRMAN. *"Old timers" like myself certainly do enjoy them.*

Capt. W. W. Porter
Spokane, Wash.

To all readers, information such as that contained in the letter above is always welcome. To reader Porter, many thanks for the kind words about articles for "old timers." Rest assured, more looks into the past will be coming up soon.

★ ★ ★

### 20/20 VISION

Sir: *Inside the back cover of the May issue,* THE AIRMAN, *you carry a picture, bottom, left, which you have identified as a Consolidated B-24* Liberator. *Has my eyesight finally gone to pot or have you inadvertently wrongly identified the aircraft? I detect a striking similarity between the aircraft in the photo and the Douglas B-18.*

M/Sgt. Clyde Davis
Donaldson AFB, S. C.

Sergeant Davis' eyesight is not failing. As a matter of fact, we would be inclined to agree that his vision must be 20/20. The aircraft pictured most certainly is a Douglas B-18 *Bolo.*

★ ★ ★

### FSSD PROBLEM

Sir: *I recently enlisted in the USAF after nine years' Navy service, and was awarded an FSSD of June 1956, the last date served in an overseas capacity. However, I served aboard ship after that date and received sea-pay until May 1957. Should my FSSD reflect this duty?*

T/Sgt. Perry Snyder
Brookfield, Ohio

No directives govern the award of an FSSD to former Navy personnel according to information received from officials in the Directorate of Military Personnel, DCS/Personnel, Hq USAF. However, USAF officials feel that an adjustment may be justified. Proper request should be made through military channels.

★ ★ ★

### NO WAIVERS

Sir: *I returned to the United States in January from a tour of duty in Japan. I requested reassignment to the same area when I reenlisted recently and was told I could not return to that area before a year had elapsed. Is there any chance of modification of this policy?*

A/1C James Marquitz
Chanute AFB, Ill.

According to information received from officials in the Warrant Officer and Airman Assignment Division, DCS/Personnel, Hq USAF, the policy you cited is still in force, no waivers are being approved, and no revisions are contemplated at this time.

★ ★ ★

### COMMAND PILOT WINGS

Sir: *There are some pilots in the USAF who will never be eligible for a command pilot rating before retirement.*

*Regular officers who held a valid navigator or observer rating in 1951 and 1952 were allowed an age waiver to attend pilot school. Many of these men will have between 25 and 28 years' service before acquiring the 15 years' rated pilot service required for command pilot wings. Their total years' rated service and total rated hours will be in two categories, while evaluation is based on the single category of pilot time.*

*I believe that this is an inequity, and I think prior rated time should be taken into consideration for both senior pilot and command pilot ratings.*

Name Withheld

Officials in the Flying Status Branch, DCS/Personnel, Hq USAF, feel that a misunderstanding of the principles involved in the award of senior ratings exists. Advanced aeronautical ratings are symbols of achievement in a specific rating. Therefore, flying time and experience gained as an observer or navigator cannot be accredited as pilot experience.

No regulation exists which requires pilots to reach command pilot requirements by a specific age, although the Central Flight Status Selection Board currently reviews flying records of men who have not attained that rating by age 43. However, in the review process full consideration is given to the facts of each case, and where it is obvious that the officer could not possibly have attained the advanced status because of circumstances, recognition is made of this fact.

★ ★ ★

### FLIGHT TRAINING

Sir: *I enlisted in the Air Force in September 1957. For years my main desire in life has been to enter flying training; however, because I am married I am ineligible.*

*All of my other qualifications are excellent. I am 21 years old, physically fit, and have approximately 50 hours' college credit. Is there any way in which I can realize my goal of flight training within the Air Force?*

A/3C David Cudd
Manzano Base, N. Mex.

Past experience is the basis for the policy regarding marital status for aviation cadet training according to information received from officials in the Officer Procurement Branch, DCS/Personnel, Hq USAF.

While married candidates are usually the academic equal of their single counterparts, many additional considerations play a major part in this decision. Strict discipline, rigid training schedules; and relatively low pay do not offer the desired environment for marriage. Past records provide ample proof that resignations from married cadets far outstrip those from single candidates. This fact, as well as revised USAF force structures and austere funding and manpower programs, has caused USAF officials to establish strict criteria for cadet applications and no deviations from policy.

★ ★ ★

### APOLOGIES

Sir: *On page 33 of the March-April issue of* THE AIRMAN *you report that Col. Michael N. W. McCoy died in 1956. I believe if you will check the records you will find that Colonel McCoy was killed in an aircraft accident in the fall of 1957.*

A Friend of Col. McCoy's

Our original source of information was in error. A check with Casualty Branch, DSC/Personnel, Hq USAF discloses that Colonel McCoy was killed in an aircraft accident on October 9, 1957—not as originally reported, April 9, 1956.

# Other Letters

HEADQUARTERS
AIRWAYS AND AIR COMMUNICATIONS SERVICE
MILITARY AIR TRANSPORT SERVICE
UNITED STATES AIR FORCE
SCOTT AIR FORCE BASE, ILLINOIS

6 MAY 1958

Technical Sergeant John K. O'Doherty
THE AIRMAN Magazine
Tempo E, Room 2-206
4th & Adams Drive, SW
Washington 25, D. C.

Dear Sergeant O'Doherty:

Your story, "Communications Unlimited - The Magic of AACS," in the May issue of THE AIRMAN was one of the best journalistic portrayals of this organization in its work clothes that I have ever read. It was warm with understanding of the people of AACS and perceptive in its treatment of their assignments.

In addition to its insight into the undercurrent of tradition in AACS's day-to-day support job, your story captured the collective personality of this organization in a way that, I believe, will react on the flying men of the Air Force as a vindication of the confidence they place in our people.

Please accept my thanks for a thoroughly explored, interestingly written article.

Sincerely,

DANIEL C. DOUBLEDAY
Major General, USAF
Commander

---

Headquarters
63D TROOP CARRIER WING, HEAVY
United States Air Force
Donaldson Air Force Base, South Carolina

SUBJECT: Letter of Appreciation

THRU: Colonel Robert B. Good
Chief, Internal Information
Office of Information Services
Headquarters United States Air Force
Washington 25, D. C.

TO: Master Sergeant Edison Blair
The Airman
Room 2-206 Tempo E
4th and Adams Drive, S. W.
Washington 25, D. C.

1. Your literary and photographic coverage of Air Force participation in Operation Deepfreeze III has been enthusiastically received by me and the personnel at Donaldson Air Force Base. The articles were informative, perceptive, and extremely accurate. Your efforts have resulted in outstanding examples of quality photo-journalism.

2. In both the February and March-April issues of The Airman, your articles appeared depicting the grand achievement of several hundred Air Force personnel working arduously and diligently for the advancement of American scientific knowledge in Antarctica. During this period these men added substantially to their experience level as members of the Military Air Transport Service system of global airlift. It is indeed gratifying to have such a successful operation acknowledged by The Airman.

3. It has been with sincere pride and deep satisfaction that I have read and enjoyed your articles. The personnel on Deepfreeze III join with me in extending a "Well Done" to you for your successful assignment in the Antarctic.

WILLIAM G. FORWOOD
Colonel, USAF
Commander
Air Force Task Unit
Operation Deepfreeze III

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HEADQUARTERS
AIR RESEARCH AND DEVELOPMENT COMMAND
UNITED STATES AIR FORCE
ANDREWS AIR FORCE BASE
WASHINGTON 25, D. C.

OFFICE OF THE COMMANDER

10 MAR 1958

Major General Arno H. Luehman
Director of Information Services
Office, Secretary of the Air Force
The Pentagon
Washington 25, D. C.

Dear Arno:

In behalf of the military and civilian personnel of the Air Research and Development Command, I should like to congratulate the staff of THE AIRMAN magazine and M/Sergeant Edison T. Blair in particular, for the timely article on "ARDC--Guardian of the Future," which appeared in the January 1958 issue of THE AIRMAN.

Articles of this type contribute to a better understanding of the mission and activities of this command and make for a finer appreciation of the science-military-industry partnership required to achieve and maintain the qualitative superiority of the nation's weapon systems.

You may be assured of continued ARDC cooperation in your news reporting and publications.

Sincerely,

S. E. ANDERSON
Lieutenant General, USAF
Commander

---

*Office of the Commander*

HEADQUARTERS
AIR MATERIEL COMMAND

*Wright-Patterson Air Force Base, Ohio*

1 JUL 1958

Major General Arno H. Luehman
Director of Information Services
Office of the Secretary of the Air Force
Washington 25, D. C.

Dear General Luehman:

Almost a year ago the first edition of The Airman magazine appeared on the scene. I can't think of a better time than now, as The Airman nears its first anniversary, to offer you my heartiest congratulations on a job well done.

The Airman fills a void that had long existed in the Air Force internal information program, and is making a most valuable contribution to the over-all USAF effort.

I enjoy reading each issue, and look forward to many more years of success for your fine magazine.

Sincerely,

E. W. RAWLINGS
General, USAF
Commander

---

HEADQUARTERS STRATEGIC AIR COMMAND
Offutt Air Force Base
Nebraska

21 March 1958

Major General Arno H. Luehman
Director of Information Services
Office of the Secretary of the Air Force
Washington 25, D. C.

Dear General Luehman:

On behalf of all the men and women of the Strategic Air Command, I wish to congratulate you and the staff of The Airman for the excellent and highly interesting article, "SAC...Yesterday, Today and Tomorrow," which appeared in the February issue.

I am convinced that stories of this type prepared particularly for Air Force personnel and their families are vitally important to proper understanding of the mission and roles of the Air Force and its major commands.

Sincerely,

THOMAS S. POWER
General, USAF
Commander in Chief.

THE DESTINY OF THE NORTH AMERICAN AIR DEFENSE COMMAND...

# In Defense of a Continent

by Capt. Ted R. Sturm

*Photo by M/Sgt. Claude W. Treece, USA*

I SAT in the center chair on the top dais of the Combat Operations Center (COC) at Colorado Springs. From that chair Gen. Earle E. Partridge, a USAF four-star general, could speak the words which could cause a President and a Prime Minister to mobilize their two countries.

Simply by speaking those few words into a red telephone, he could put the greatest air defense aggregation in mankind's history in motion.

If he were not there, his deputy, Canadian Air Marshal C. Roy Slemon, RCAF, would do all these things.

At his fingertips, in that chair, and through that phone, is a straight electronic line to more instantly reacting destructive power — both defensive and offensive — than the combined forces of all the military might since Genghis Khan. In the event of a massive air attack against this continent, he not only can set in motion the North American Air Defense Command (NORAD), but he can also pass the word that will launch the Strategic Air Command.

In the COC is a mammoth plexiglas surveillance board displaying information from the entire North American Continent. It is the focal point, the central brain and nerve system of NORAD.

At any second, day or night, year after year, General Partridge and his battle staff might fill all of the chairs in the COC. From their seats on the top dais, the general and his staff can "see" what is happening from the southern borders of the United States to the Bering Sea; over the millions of square miles of Canada's Northwest Territories, and the frigid mountains of northern Greenland. This mammoth area has a perimeter 15 thousand miles long. It encompasses eight million square miles of freedom.

Within seconds, the general can speak to an individual at either extremity of NORAD's vast area. At his command, the air defense forces of two nations can be galvanized into action within minutes. And minutes are of the essence.

Today, NORAD exists because of the new, 20th century, life or death importance of *Time*. It is as real a weapon as the missiles carried aboard NORAD's fighter planes; as real as the constantly rotating antennae of its many radar stations; as essential as the life and liberty of the millions of people over which NORAD stands guard.

Vested in General Partridge, Commander in Chief of NORAD, and the soldiers, sailors, airmen, and civilians of the United States, and the airmen of Canada is the mission and destiny to "Defend the North American Continent against air attack."

### Cure for Insomnia

In Col. Barney Oldfield's office (he's NORAD's Director of Information Services) I was deluged with facts and figures about NORAD. They were far from boring and were prefaced with a remark that is typically "Oldfield."

"If you really want to cure insomnia caused by worry over national security, visit a couple of our Air De-

fense Divisions. Watching them operate is better than sleeping pills," he said.

"Division?" I asked. "I thought they were just for the Army." He chuckled and remarked that that was generally true.

"But not *just* for the Army—particularly in NORAD, where each of our divisions includes representatives of the Army, Navy, and Air Force. In fact, one of them includes the Marines. It's the 85th Air Division at Andrews AFB. They have a king-sized job you should look into, but the place to start is at the top," he said. "This is how NORAD is organized to do its job."

He started at the top of the organizational chart and the top of the world. NORAD was born last September, a natural offspring of the U. S. and Canadian defense union. General Partridge, as supreme commander, is responsible and accountable to the Joint Chiefs of Staff of the United States, and the Joint Chiefs of Staff Committee, Canada.

The Continental Air Defense Command (CONAD) still lives on as a part of NORAD headquarters, staffed with U. S. personnel only. As one might imagine, CONAD is concerned with legal and administrative defense problems exclusively U. S. The entire country is divided into three CONAD regions which are directly responsible to headquarters NORAD.

There is the Eastern CONAD Region (formerly Eastern Air Defense Force) the headquarters of which are located at Stewart AFB, N. Y. The entire eastern area of the United States is under the Eastern Region.

The central U. S. is under Central CONAD Region, with headquarters at Richards-Gebaur AFB, near Kansas City, while Hamilton AFB, Calif., headquarters the Western CONAD Region.

Reaching into the far north, the Commander in Chief, Alaska, has been designated the subordinate joint commander responsible to General Partridge for the air defense mission of that territory. The northeast approaches to the U. S. are covered by the 64th CONAD Air Division (Defense) which has its headquarters at Ernest Harmon AFB, Newfoundland, and its fighter squadrons at bases in Labrador, Newfoundland, and Greenland. The 64th, although an air division rather than a region, reports directly to NORAD in Colorado Springs; yet its three fighter squadrons are under the operational control of RCAF/ADC headquarters at St. Hubert, Montreal.

The keys of the whole organization are the direction centers throughout the 16 Air Defense Divisions. From these centers, air battles are directed —unknowns are detected and tracked, interceptors are scrambled, and missiles and other defense forces are alerted. Information is passed immediately to division, region, and NORAD. This independence and interdependence is the cornerstone on which the defenses of the continent are built. Like an amoeba, NORAD lives and breathes as one entity or functions in bits and pieces right down to one pilot and his airplane. This is called, officially, decentralization of control.

Gen. Earle E. Patrtridge, NORAD's Commander in Chief, and his Deputy Commander in Chief, Air Marshal C. Roy Slemon, RCAF.

### Four Commands

Under NORAD are four major commands representative of the first true joint command ever established within the United States. The Air Defense Command, major component force of NORAD, is responsible for the Air Force part of the defense job. ADC is commanded by Lt. Gen. Joseph H. Atkinson. The U. S. Army Air Defense Command, headed by Lt. Gen. Charles E. Hart, furnishes surface-to-air missile battalions for the air defense of the United States.

The Navy's contribution to NORAD includes the extension of radar coverage by use of picket ships, lighter-than-air aircraft, and augmentation forces of naval and marine interceptor aircraft. It is also responsible for the seaward extension of the Distant Early Warning line. NORAD's naval forces are commanded by Rear Adm. Walter Fred Rodee. Completing the bi-nation, tri-service headquarters at Colorado Springs is the Air Defence Command of the Royal Canadian Air Force.

Canada spells defence with a "c," but no matter how you spell it, it means the same thing. Air Marshal C. Roy Slemon, RCAF, serves as Deputy Commander in Chief of NORAD while Air Marshal Larry Wray commands Canada's ADC.

At this point in the discussion, I held up my hand. "But you said NORAD was integrated," I protested. "How come all these separate commands?"

"Simple," he countered immediately, and I didn't know whether he meant the answer or me. "The three services naturally retain their individuality and functions. It is the way these functions are combined to accomplish the overall mission that creates a truly *integrated operation* for the attainment of a common goal. At this headquarters Air Force, Army, Navy, Marine, and RCAF personnel work side by side, in the same direc-

torates, and except for the uniform you can't tell what service they represent. Further, you'll see the same thing in most divisions." I felt that it was time to visit a division, and Colonel Oldfield agreed. "After all," he remarked, "that's where the work is done."

### From Personal Experience

Enroute to the east coast I tried to get the basic facts of NORAD straight in my mind. First off, NORAD exists because of the ever-present threat of air attack. It is a tribute to the American vow that Pearl Harbors are sheer folly, inexcusable, and, in this day and age, suicidal. As John Curran said in 1808, "eternal vigilance is the price of liberty."

Thus NORAD's eternal vigilance takes the form of daily *"DIIDs"*; the

"Don't you *EVER* yell 'scramble' in the middle of the night again!"

## NORAD TODAY

The North American Air Defense Command, of which I am the present head, is an organization unique in the history of our two countries. It is composed of elements of the Royal Canadian Air Force and of the Army, Navy, and Air Force of the United States. NORAD is a planning and operational organization, designed to pull together under one integrated Canada-U. S. headquarters at Colorado Springs, Colorado, the operational control of the Air Defense System of Canada, Alaska, and the United States.

The system consists primarily of two parts: a vast surface and airborne network of warning and control facilities tied together by a complicated communications network, and of air defense weapons for employment within this early warning and control system.

The Command is responsible to the Joint Chiefs of Staff of the United States and to the Chiefs of Staff Committee of Canada for controlling the air defense of North America north of the Mexican border. The control exercised by NORAD headquarters is purely operational and does not involve the command of the forces assigned. The NORAD headquarters is limited strictly to operational matters such as the operational direction of the system, the standardization of procedures and techniques, planning for the future, and the provision of intelligence and communications to permit the system to operate effectively. The NORAD system has been functioning on an interim basis since last September, and it is set up in such a way that if war were to break out, it would not have to be changed in any way but merely reinforced. The system operates 24 hours a day.

E. E. Partridge

E. E. PARTRIDGE
General, USAF
Commander in Chief, NORAD

*Detection, Identification, Interception,* and—if the time should come—the *Destruction* of hostile invaders. How these functions are accomplished constitutes the story of the defense of our continent.

I recalled a time when I was a guest at a lonely, Arctic radar site situated at Saglek on the rugged coast of northern Labrador. The site is part of the Pine Tree System—a series of unit detection and warning stations extending from the Labrador coast westward to the Pacific. It supplements the Mid-Canada Line located in central Canada. These two lines, plus the famed DEW (Distant Early Warning) line of the high Arctic, provide an early warning and detection system in depth for Canada and the United States.

The Saglek AC&W site, as part of the radar fence, was built to give warning of approaching unknown or unfriendly aircraft. That is its primary job. But like every other northern radar station it daily performs services for pilots flying over the isolated north. Navigation assists, weather information, aid in emergencies, and just routine, comforting chatter ease the burden of Arctic flying.

If you've seen the inside of one radar site, you've just about seen them all. They are all similar in construction, identical in organization and function. They have built-in recreation rooms, movies, exchanges, and most of the facilities of a base—on a Lilliputian scale.

In the operation room, or radar section, several men form the "point" of North America's defense. Their never-ending vigil is the epitome of monotony—but boredom has no place here, for these men and their radar scopes will be the first contact with an enemy bent on attack. Here at Saglek, and at the stations of the DEW line, is the source of the marks on the high tote board at Colorado Springs, as well as those of the regions and all of the divisions—the information that tells General Partridge and his staff whether or not to push the button and say certain words into the little red telephone.

### Through the System

Operation of this gigantic radar net borders on the fantastic. At a DEW line or other radar site across the Arc-

The Convair F-102 *Delta Dagger* gets a daily workout by crews of ADC's interceptor squadrons.

tic and up and down the continental flanks, an airborne "target" is picked up on the scope. A "track" is established and pertinent information is flashed to NORAD, Canada, adjoining sectors, pertinent divisions, and regions. The radar site attempts to identify the target from military or commercial flight plans and schedules, and if this fails, the site direction center scrambles a fighter to go look at the unknown. This is the last resort at identification. If it is friendly —and so far they have all been—the fighter goes home. If enemy, the fighter would destroy it and all of NORAD, SAC, and the civil defense organizations of the U. S. and Canada would be alerted.

Daily, an average of 20-30 scrambles are performed by ADC fighters. With roughly 800-900 commercial and military flights entering the U. S. daily, and more than 30,000 flights within the U. S. each day, ETAs are sometimes off more than the allotted five minutes and flight paths occasionally take aircraft beyond the 20 mile radius established by ADC for position reports. Any time the five minute ETA limit and the 20 mile radius are exceeded, a fighter may have to go up.

But there is more to air defense than just that. As I arrived at the 85th Division, I took my briefcase and went to learn just how much more.

### From the Oceans . . .

It would appear that the Lord, in His infinite wisdom, spawned freedom on a continent where it could develop and grow strong. Its protection was isolation, with thousands of miles of Arctic waste to the north and great oceans to the east and west. But freedom is mature, now, coincidentally with the scientific progress rendering geographic protection obsolete. Today the oceans still offer protection, but it is man-made and man-operated. Navy picket ships, multiengined aircraft, and big blimps cruise up and down the coastlines, both east and west, watching for an enemy. And on the wierd Texas towers, airmen operate AC&W equipment, living and working on terra firma forged in the steel mills of the countries they guard.

Big Aircraft Control and Warning sites are strategically scattered throughout the Eastern Region to provide as complete a radar coverage as possible. It is the same way in the central and western areas, and throughout the northern Pine Tree, Mid-Canada, and DEW lines.

Where terrain is such that the big radars can't quite cover the approach routes, smaller radars—many of them automatic—fill in the gaps. Appropriately, they are called Gap Fillers, and every radar fence uses them.

Yet even the Gap Fillers do not provide 100 percent, bona fide foolproof coverage. Where the radar eyes cannot see, human eyes take over. These human eyes belong to the hundreds of members of the Ground Observer Corps—volunteer civilians who fill important niches in this mas-

An F-89 *Scorpion* with a *Falcon*, air-to-air guided missile in firing position.

sive, heterogeneous command called NORAD. GOC is presently on a standby status, ready for immediate action in the event of an emergency.

### At the 85th

Lt. Col. Shale "Bud" Tulin is an energetic, press-wise ISO with greying hair and a big job. At Headquarters, 85th Air Division, he handles numerous VIP visits and press inquiries prompted by the fact that the 85th is located on busy Andrews AFB, a short drive from the Nation's capital.

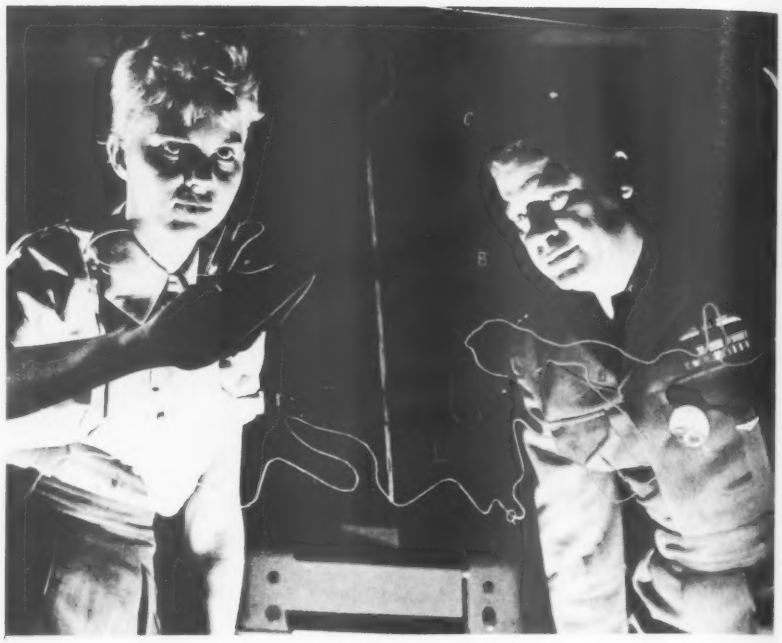
Protecting the big-domed buildings and inhabitants of the District of Columbia and 110,000 square miles of territory that includes parts of seven states, the 85th boasts a full array of 20th Century defense weapons. Like all ADC divisions, it has operational control over the six subsectors within its area. If ever a division could depict the business of defense in all its complex, hurry-up-and-wait functions, the 85th is it.

At Andrews is the division's control center, from which movements of every aircraft, military and civilian, are traced within and beyond the 85th's boundaries. From here the air battles throughout the six subsectors would be coordinated or directed.

The 85th's commander is Col. Theron Coulter, whose office is a scant 15 feet from the Control Center Command Post. From that point, with a visual display of the air "picture" on the massive plexiglas board showing the entire eastern seaboard, he can bring into play the many weapons at his disposal.

Within the 85th area are six long-range radars located at Manassas, Cape Charles, and Bedford, Va., and Roanoke Rapids, Kure Beach, and Winston-Salem, N. C. Respectively, the colorful call signs of these sites are: *Inform, Jitney, Blue Texas, Bath Box, Fogarty,* and *Jungle Jim.* Seven gap fillers plug the holes left by the long-range radars. Navy picket ships patrol the Atlantic along with USAF RC-121 *Super Connies* known throughout the division by the call sign *Gin Fizz.* The Marines also furnish augmentation radar at Cherry Point, N. C. and the Navy does likewise at Dam Neck, Va.

These units provide the 85th with detection and identification. Its interception function is the roll of three



Writing backwards on the surveillance board is a trick learned through training. An RCAF duty officer watches the demonstration.

fighter-interceptor squadrons, using Convair F-102 *Delta Daggers.* Augmentation squadrons of the Air National Guards of Maryland, District of Columbia, and West Virginia are also available flying F-86H aircraft. TAC also furnishes augmentation fighter aircraft from the 354th Fighter Day Wing at Myrtle Beach AFB, S. C., and the 4th Fighter Day Wing at Seymour Johnson AFB, N. C.

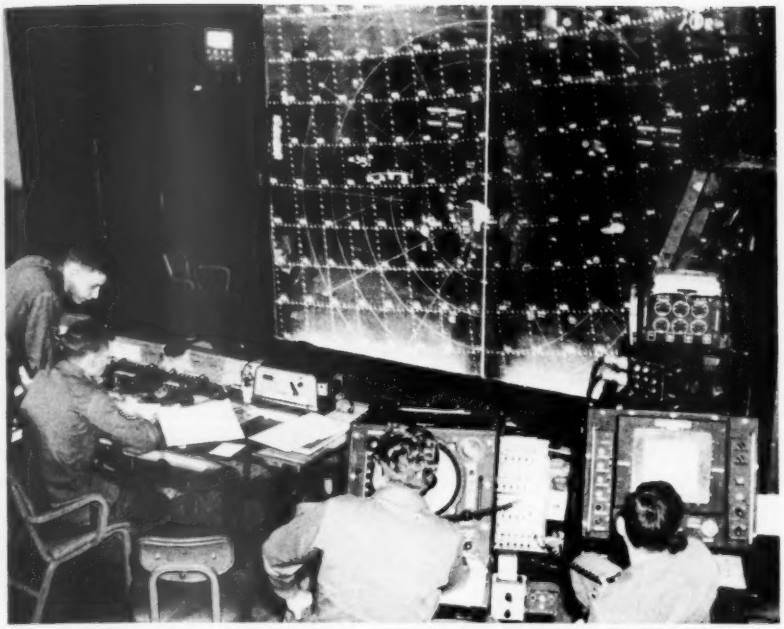
Additionally, the U. S. Marine Corps may make available fighter units of the 2d Marine Aircraft Wing at Cherry Point, while the Navy may include its Fighter Fleet Air Detachment at Oceana.

In case the enemy gets close, 24 *Nike* Fire Units of the 35th Artillery Brigade (Army Air Defense Command) are deployed in the Washington-Baltimore area. The 35th's headquarters are at Fort Meade, Md.

"We're alone in a crowd," Colonel Tulin explained. "Like all divisions, we would fight our own battles. Yet to the north are the boundaries of the 26th Air Division, to the west, the 58th, and to the south the 35th. And, of course, we have our direct lines to Eastern and NORAD headquarters." After explaining this set up, Colonel Tulin concluded by saying, "We hope that the air battle of the Washington sector will be fought out to sea, or in sectors on the fringes of the division boundaries." I said thanks and left for the 48th Fighter-Interceptor Squadron, located at Langley AFB, Va. The outfit flies F-102s and is part of the Washington Defense Sector. The commander is Lt. Col. Lawrence McIntosh.

Typical of ADC fighter-interceptor squadrons everywhere, the 48th has its orderly room, briefing room, alert room, hangars, and weapons storage warehouse. The "Big Bird" is called "The Deuce" and it takes up a lot of hangar space. When you walk into this beehive, a business-like guard checks your credentials. I was escorted by Capt. Wilmer E. Jones, who handled supply and armament, and electronics. (He's since departed Langley.) After Captain Jones vouched for me and my credentials were checked, I moved across the hangar floor. Mechanics were swarming over the needle-nosed F-102 as though they must get it fixed and into the air within the next few seconds.

"These squadrons are all basically the same," Jones explained. "It really doesn't matter what kind of aircraft—the F-89, 102, or what have you.



The operations room of a Central Air Defense Region AC&W site.
*Photo by T/Sgt. Andrew Clark, Richards-Gebaur AFB, Mo.*

They all operate the same. Only the equipment is different."

Jones guided me out of the hangar, across a plot of grass and into the alert room. It was a familiar scene.

Pilots lounge, play cards, and read, while miles away a radar man starts the chain reaction that reverberates through hot lines to plotting boards, direction centers and the nerve-tingling alert bell that abruptly shatters the tranquility of the alert room.

Then comes the inevitable scramble and the interception.

### New Weapons

In Maine, the missiles are moving in. *Bomarc* sites are being readied and crews are in training. NORAD guards with one hand, and trains with the other. The first *Bomarc* training center is under construction at Hurlbert, (Eglin 9) Fla. for the AF ADC. It will be controlled from the 73rd AD (D) (Missile Evaluation) at Tyndall AFB, also in Fla.

Although missiles — air-to-air, ground-to-air, guided and unguided —are being added rapidly to the weapons inventory, fighter pilots are quick to point out that no missile has yet been devised that can identify an incoming unknown. This will be the prerogative of the manned interceptor for some time to come. Until, at least, when manned bombers succumb to ICBMs; and that time may never come. The feeling at NORAD is that the enemy will use both missiles and manned bombers in any future attack.

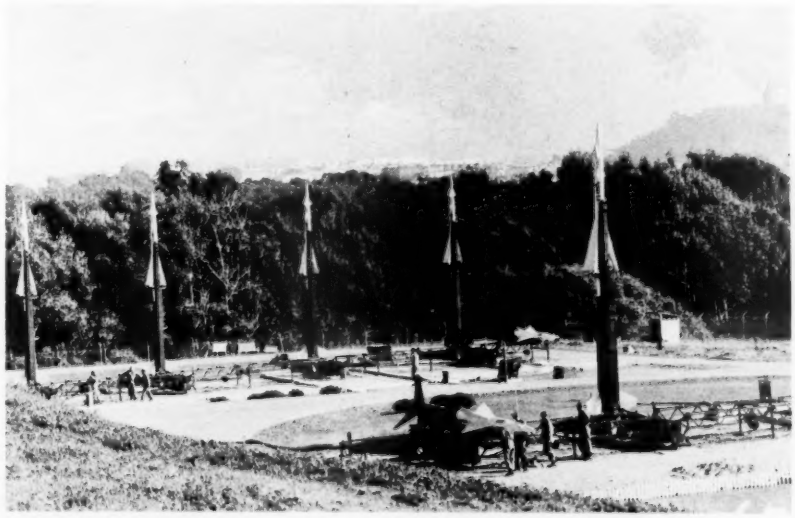
Today 2.75 mm. rockets, the *Falcons* (radar and heat-seekers), *Sidewinders,* and the MB-1 atomic rockets are the main air-to-air weapons. They are matched with the F-89, F-102A, F-101B, F-104A, and the F-106. Upcoming are new fighters such as the F-108, a two-place Mach 3 aircraft which should carry a new *Falcon* containing a nuclear warhead.

The Army's *Nike Ajax* is a point defense weapon with a ceiling comparable to the *Bomarc,* while the *Nike Hercules*—making its debut this year —triples the *Ajax* range.

Then the Air Force *Bomarc* is the long-range, ground-to-air missile which can carry a nuclear warhead supersonically roughly 200 miles and higher than 60,000 feet. To follow is the IM-99B which will increase the range of *Bomarc* area defense almost twice the present range. The "B" will use a solid propellant and reduce the defense reaction time by a significant and all important *Time* factor.

### Automaticity

In reflection, one outstanding fact illuminates the complexity of the air defense problem. That fact is human limitation and error, which in this day and age, courts disaster. The vastness of the area to be defended; the thousands of radars and individual air battles; the immensity of the mathematical calculations and correlations necessary to conduct a full-scale air battle; and constantly changing combat situations all cogently emphasize the need for foolproof machines.



A Nike site near San Francisco, Calif.

Officers and airmen are trained in SAGE operations at facilities such as these. This is the situation and auxiliary display console of the training battle simulation room.

NORAD calls this "automaticity." It is a coined word which means, simply, that detection, identification, interception and destruction must be split-second operations—as nearly automatic as it is humanly and scientifically feasible to make them.

Time is the only difference between an attack by airplanes and an attack by missiles. But that difference determines victory or defeat; success or failure; national life or death.

A system called Semi-Automatic Ground Environment (SAGE) is NORAD's answer. With SAGE, all of the data from the vast network of radars and detection devices are fed to electronic brain-centers.

Instead of human minds solving the myriad problems, information detected by radars travels through telephone lines to computer centers where the data is digested, correlated, and presented to a human operator.

The operational decisions are retained by man, but the factors on which to base the decisions are assimilated by machine. The decision itself is then automatically transmitted to the proper weapon system.

Today, the air-waves still crack with commentary between controllers in Ground Controlled Interception stations, jet pilots, and radar intercept observers who watch their scopes from the back seats of F-89 *Scorpions* and F-101B *Voodoos*.

*"Vector zero three zero, angels 20."*

*"Roger, have contact—gate and hard port."*

And through the murky night the pilot and radar observer streak toward another unknown.

Yet little by little the chatter is disappearing as SAGE takes over. It is a three-stage process which pokes well into the future. Today the voices direct the pilot until the airborne radar sees the target. Tomorrow, the pilot will take off and land the aircraft, while automatic pilots receive coded information which "flies" the aircraft to the target.

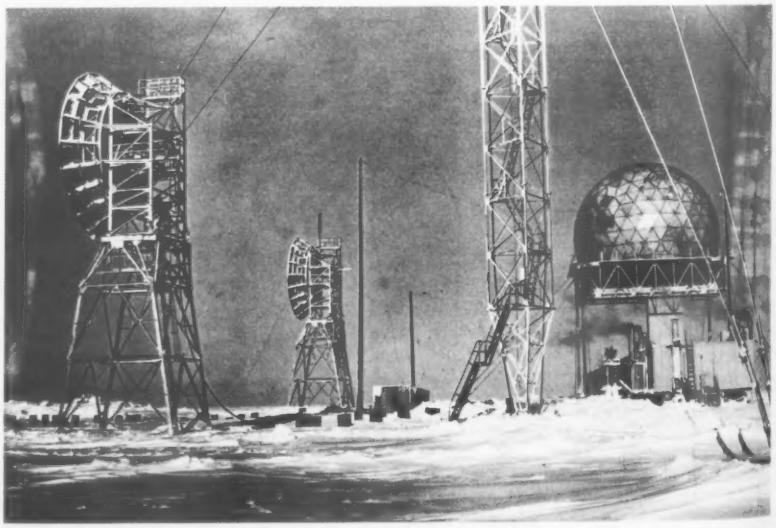
Eventually, the missiles will be on their own. A target will be detected, identified, intercepted, and destroyed through the marvel of electronics and the nuclear lethality of a missile. This would truly be the age of "push-button" war.

How far along this road is the Air Force?

Effectively, the era of "push-button" war is here today. Not completely, but the strategy is formed, the system is in operation and all that remains is refinement of devices. Take the Ballistic Missile Early Warning System, for example. Existing detection networks are limited because of the speed and altitude of ballistic missiles. Called BMEWS, the new system would squeeze more valuable seconds from the four basic functions by tying directly to NORAD's Combat Operations Center. With SAGE and *automaticity*, defensive or offensive air war can be launched by push buttons.

Defensive and offensive operations are so closely entwined that one depends upon and is resultant from the other. Thus, all the horrors of nuclear war are bound together by time, and time is the purpose of automatic, "push-button" warfare.

The only decision remaining today and tomorrow is: Do we push the buttons? And that decision must forever be retained by man.

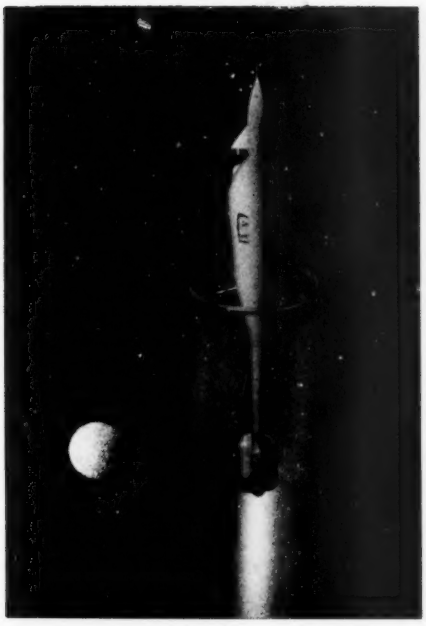


A DEW line station, somewhere in the high Arctic.

# NOT BY A

# *Single Bound*

**by William A. Kinney**



Heaven is not reached by a single bound;
But we build the ladder by which we rise
From the lowly earth to the vaulted skies
And we mount its summit round by round.

—JOSIAH GILBERT HOLLAND
in *Gradatim* (Gradually)

*It has been a long countdown.*

*Fifty-one years ago this month the Aeronautical Division of the U. S. Army Signal Corps formalized the first efforts to boost the military man up off the earth on which he had marched and fought since time began.*

*Today, speculation on when man will make his first flight into space may be read in your daily newspaper or favorite magazine. The intervening years have been full ones; each has had its share of small triumphs in the progress of flight, and, it seems, more than its share of disappointments and even tragedy.*

*But in looking back down this long corridor of years, it seems to me that man has always been reaching for the stars although his immediate effort might have been devoted to nursing some balky crate up and over a set of high tension power lines, or perhaps fighting imminent blackout in a five-G turn around a pylon at practically zero altitude.*

*In all this the pilot has been accompanied, and in some cases preceded, by the flight surgeon whose continuing task it has been to try to predict the unknowns of human reaction to an essentially hostile environment.*

*Mr. Kinney's articles in this and coming issues of* THE AIRMAN *paint a rather clear picture of how today's flight surgeons, both in the air and in their laboratories, are working to meet the challenge of again charting the unknowns of human reaction, this time to the totally alien environment of space.*

*Mr. Kinney's is an interesting story, filled with the qualities of wonder and amazement. As Albert Einstein once said, "The fairest thing we can experience is the mysterious. It is the fundamental emotion which stands at the cradle of true science. He who knows it not and can no longer wonder, no longer feel amazement, is as good as dead."*

*I think most of us will feel this quality of amazement as we read Mr. Kinney's articles. Certainly he has given us a clear look at what we believe man will face when he dares to leave mother earth for his unknown destiny in the heavens.*

Maj. Gen. HARRY G. ARMSTRONG
USAF (Medical Corps)

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THE CHALLENGE of putting man into space is by far the most stimulating that medicine has yet moved to meet.

It is obvious that the key factor in the successful investigation of this high realm and its ultimate utilization hinges on the human factor, that incredibly versatile and intelligent system of combined capabilities which no vast array of electronic computers and other devices can approach.

The challenge of putting man into space does not mean only that. It involves the ability of a nation's best medical talent to so help him that he will be able to survive and function efficiently in the most hostile environment any mortal has dared to penetrate. It also extends to provisions for his return unharmed.

Though their vehicles may be the last word in technological excellence, dead men orbiting in space will never unlock its secrets or tame its resources for human uses. They can no more do that than lost expeditions and vanished colonies made decisive contributions in the golden age of exploration and discovery which opened up the New World of the two Americas over four and a half centuries ago.

In attacking the problems of assisting man to space, the medical profession finds itself more affected than ever before with the lore of various sister sciences such as astronomy, physics, and chemistry and their mechanical or technical applications. It also serves as a helpmeet to inventive genius.

At first glance this may seem an unaccustomed role for the American physician. Actually, there is high tradition behind it. The man who flourished in the first decades of the Republic and has been called the father of American surgery, Dr. Phillip Syng Physic of Philadelphia, was a would-be inventor turned physician. Of marked mechanical bent, his desire as a youth was to pursue the calling of his grandfather, a goldsmith. Yielding to family pressures, however, he went reluctantly abroad to study medicine and soon established himself as a brilliant ornament of his profession when he returned home to practice. But he never forgot his first love and his inventive ingenuity gave us the prototype of a number of surgical instruments still in regular use today, as well as special techniques he originated.

Another distinguishing feature of American medicine has been its increasing preoccupation with preventive research and programs as contrasted with the remedial or healing employment of professional skill. And space calls for preventive medicine at its best. The objective here is not the acquisition of remedial "know how" which will enable us to patch up expertly the battered body of some returning astronaut. Rather our efforts have concentrated on developing the "know why" that teaches us what causes the battering or any other untoward effects space missions may bring. Forearmed with this information, I was told by numerous physicians specializing in aviation and space medicine, we can proceed with medical and techno-medical measures to safeguard against certain hazardous conditions which can be anticipated and either neutralize or minimize others.

### Overlooked Headstart

There is a widespread tendency to look upon the problems and challenge of space as something almost brand new, as revolutionary, added to the world scene in less than a year. More than a few aeromedical experts said THE AIRMAN has done a distinct service toward correcting this erroneous conception by publishing *It's A Grand Old Name*, the two articles which tell how a quarter of a century ago a systematic start was made in studying what demands aeromedicine must be prepared to cope with effectively in missions at what was then considered extreme altitude but which we know today as the zone of partial space flight equivalence—those remote heights where exist most of the conditions to be encountered orbiting an ellipse.

Since that beginning an enormous amount of pioneering research has been done, backed by practical experimentation to test the validity of its findings. Much of this work has been done at the School of Aviation Medicine, but substantial contributions have also been made by regular medical schools, universities, associations of medical specialists, commercial enterprises, and other organizations cooperating under various arrangements. Moreover, today's medical officers have available the large amount of information which the Air Force has built up in the course of routine regular operations at very high altitudes on a scale and over a period of time unmatched by any other country.

The store of knowledge accrued to date may be conservatively described as impressive. It contains the solutions for many of the problems immediately besetting man's trailblazing ventures into the mysterious vault beyond the atmosphere. It also points the way to likely methods of dealing with others apt to be encountered as astronautical exploration progresses.

"As a professional man," said one medical expert, "I would indict myself were I to claim that space medicine expects to have all the answers firmly in hand and soon, but I do say I know of no highly specialized field in all medical history which has gone forward so remarkably in such a brief span.

"Acknowledge the uncertainties which may plague us for some time to come, I might liken our state to that of the courageous 'chirurgeons' and bloodletters who traveled with the great captains of discovery or stood on the same hostile beachheads with the first settlers. They had to reckon with many unknowns. Some unknowns never materialized, like the fabled sea serpents and other huge beasts of the deep. Others did, in the form of strange disorders or diseases to be treated or mastered. It will be no surprise if a comparable pattern recurs."

THEN UP TO A RECORD. Equipment receives final pre-takeoff check in capsule which carried scientist-airman, Maj. David G. Simons, up to an altitude of 102,000 feet, or almost eight miles beyond the frontier where space flight conditions begin. This mission, August 20, 1957, lasted 32 hours. The *New York Times* hailed Simons editorially as "The First Space Man," pointing out he was the first human to live a whole day and more, far beyond the zone where the earth's atmosphere ceases to support life.

### The First Step

Chief of Staff, General White has set a most commendable example in staking out his territory carefully when he talks on any aspect of that enormously vast subject—space. At the outset I propose to do likewise. The beckoning prospect of a stirring new age of exploration and discovery through the trackless reaches of space has so excited imaginations that many men in their mind's eye see the first successful orbital mission quickly followed by carefree planet-hopping and travel-at-will with star buzzing as a new pastime.

This is so much arrant nonsense and all personnel should recognize it as such, in the light of existing scientific and technological capabilities and their foreseeable promise. No baby has yet made the transition from creeping by immediately pacing off a vigorous mile. There is a faltering first step before a second can be taken.

Disillusioning though it may be to

those envisioning deep penetration of the wide new yonder, all indications of the moment are that the maiden space missions will not take man out of his atmospheric "back yard" which astrophysicists say ends some 600 miles or more beyond the surface of the earth. The missions will be what experts describe as "shallow." By that, I was given to understand, they will be planned to orbit in the altitude level above 120,000 feet, or some 23 miles, and to remain in trajectory for a prescribed short time.

Inasmuch as unmanned satellites have been put into orbit from approximately two and a half to five times higher, the mission altitude just mentioned may seem a disappointingly modest, even timid target. To those of that view I was instructed first to point out that in this zone all the conditions and factors exist which are characteristic of true space. I was also told to remind them that in the fabulous story of our air age its immortal, most triumphant moment is measured in the meager terms of only 59 seconds and 852 feet—the flight time and distance covered by the Wright Brothers at Kitty Hawk in 1903.

### Monkey Do

The wisdom behind a "shallow" mission program in the beginning should be obvious. The information secured by pioneer space flyers will be of surpassing value. One can imagine how eagerly those concerned with spacecraft design, construction, and future development will be waiting for the first mission's report on astrodynamic performance. And I know from many conversations with them that space medicine specialists will be most impatient to learn how things went with that vital of all component systems in a spacecraft—the human one.

Implicit in that last sentence is our determination to bring them back alive. Uncertainties are bound to pose question marks for the first manned mission and the element of calculated risk will be there, but we aim to know the knowable nature of the risk so well that the odds will be stacked heavily on the side of success. For that reason, once the proper vehicle is at hand, the first creature to be put in a brief test ellipse and returned will be a laboratory animal.

Since the early 1950s we have been sending up rockets, carrying rodents and monkeys in protective nose cones, to altitudes as high as 200,000 feet—well beyond the 80,000-foot level which marks the vertical frontier where man's systematic exploration of the space realm will eventually start.

This experimental series enabled us to record the reactions and physiological effects on the animals to the blast of launch, the interval of highest acceleration during ascent, and the period of zero-gravity weightlessness. What is more, we secured data on what happens with reentry, as well as the opening shock of the chutes which returned the cones to earth—for we brought them back alive for lengthy observation and repeated examinations.

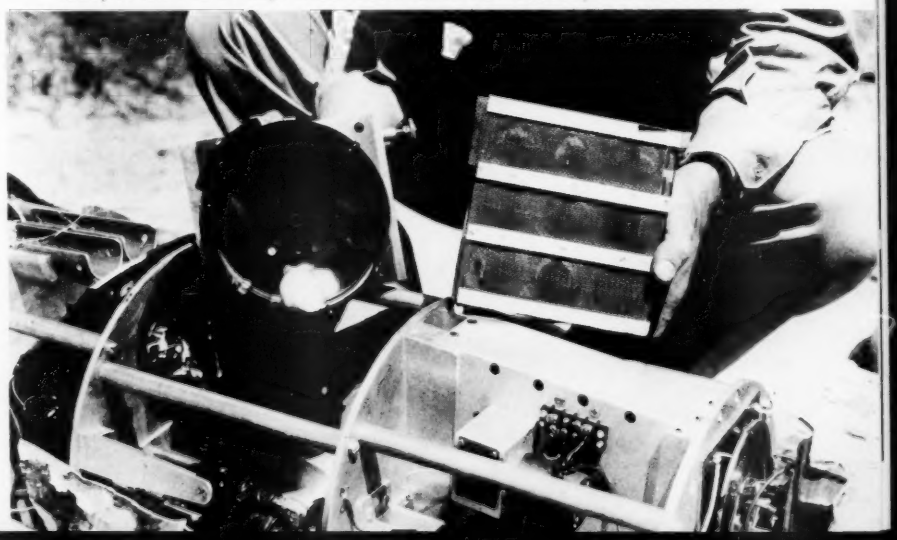
Apropos of bringing them back alive, a USAF veterinarian remarked that he believed the world's oldest pioneer of space commuting is *Iron Mike*—a Philippine Rhesus Macque recruited in 1951 for the study program. A veteran of rocket flights to altitudes of almost 40 miles, this monkey is living and healthy, at the National Zoological Park in Washington, D. C., to which he "retired" in 1953. Regular medical checkups by Air Force veterinarians show that he maintains excellent condition with no apparent physical effects from his space sorties.

I call attention to *Iron Mike* who was cited because he belongs to a species which has been used so extensively over the years in medical studies and research that two eminent scientists assert "that in many ways more is known about its biology than that of man, itself."

These alert little creatures can be trained to perform a variety of simple duties comparable to those expected of man in a highly automated cabin and they have demonstrated they can carry them out reliably, responding to some stimuli very much as a human being would react. They have done this repeatedly under conditions simulating a wide range of those which would occur in actual space flight.

Now let us turn to specifics. What will the spaceman be like—the Columbus, the Cabot, the Magellen, the Drake, and the Raleigh in the new age of exploration and high adventure? How will he live, eat, and function when he fares forth on his intrepid quest into the immense reaches of the unknown? What is the state of aeromedicine's preparations for assisting out beyond the protective bubble of the earth's atmosphere and for safeguarding him against the hazards lurking there?

BACK FROM SPACE TRIP. Technician removes mice from instrumented nose compartment of *Aerobee* after parachuted return from space equivalence flight. All experimental animals used in USAF space medicine research receive careful, humane treatment and are given sedatives before missions such as this. White mice are extremely helpful in medical research because they mature sexually at the age of one month, and a female may bear in a single year five or six litters each of from four to eight young. Thus scientists can study through a number of generations whether any ill or affliction is transmitted. Animal's small size enables many of them to be kept under observation economically in limited room.



Here is the way the rundown shapes up today.

*Physiological:* Your space pioneers will be men of good physique and in top condition. Expectations are that volunteers selected will be between the ages of 25 and 32, probably on the lean side with a weight of 155 pounds or less and under 5 feet 9 inches in height. Those accepted need not be flawless physical specimens. A man could have fallen arches, a cauliflower ear, and be minus one of his little fingers and still be first rate material because such minor imperfections would not affect his ability to do a good job. The imperatives are that his heart and arterial system, his lungs, the eyes, and both the voluntary, involuntary, and central nervous systems be in prime shape.

The medical screening program for selecting likely candidates already has been projected, along with a regimen for keeping the men fit during their training period.

*Psychological:* A successful volunteer must thoroughly convince psychiatrists that he is a well balanced and adjusted individual with no unresolved inner emotional conflicts. He must also prove he possesses strong willpower and the ability to enforce self-discipline and especially mental self-discipline. His motivation and sense of dedication must be steadfast. In character he must possess that trait that since time immemorial has sparked stouthearted men to scale lofty peaks and surmount other great physical challenges of nature, each time with the common reason: "Because it is there." Both physical and moral courage of the highest order are prerequisites. Good judgment, along with an analytical and reasonably inquisitive mind also are obvious essentials. In short, the selectees will meet the ancient Latin standard of *mens sana in corpore santo*—a sound mind in a sound body.

*Special Talents and Skills:* Space pioneers preferably will be jet pilots of the first grade with considerable experience and also possessing a superior background. The more versatile the background is the better. The ideal prospect would possess the best instincts and tenacity of a Puiltizer Prize news reporter because the assignment which sends him into space is to bring back one of the most important stories of all times, not only for medicine and other sciences but for the man in the global street as well. It follows therefore he must be a seasoned observer with an eye for all detail and sufficiently articulate to recount everything that happens. Intellectually, he will be mature beyond his chronological age and be equipped with an adequate working knowledge of astrophysics, electronics, and mechanics. I would add that a good educational grounding in biology and physiology, such as many college curricula include, would enhance a prospect's standing in the eyes of aeromedicine. If this rundown is interpreted as ruling out all but king-sized eggheads, then I can report whoever thinks so is badly off the beam.

True, we cannot expect that a legion of volunteers will come forward, each individual possessing all of these special qualifications built-in. However, the type of intelligence sought has a remarkable capacity for learning and there is good time for that before the craft for a manned mission eventually arrives on the launch pad. Many young men have unusual intellectual potentials they are unaware of until something trips the trigger. The change in outlook and attitude overnight can be phenomenal. The appetite for learning and new knowledge is voracious. The amount of material that is absorbed and absorbed well without mental indigestion is frequently amazing. This frequent failure of young men to realize their mental capacity can be compared with a person who does not know his own physical strength. Perhaps extreme youth partially accounts for it, and perhaps, too, a larger part of it is due to the age of conformity from which we have fortunately started to emerge—an age when it wasn't fashionable to be too intelligent—and give the mind as vigorous a workout as the body would get in scholastic or collegiate sports.

For personnel whose formal education may have been limited or incomplete for any reason, officials emphasize that that fact does not necessarily exclude them from consideration. Eddie Rickenbacker never would have worn wings with the AEF if he had to produce a high school diploma to acquire them. Given an inspiring challenge, an individual with a good mental potential can accomplish wonders.

There is one extraordinary, if little known, example in our country's history. He was a Maryland farmer with a few grades of elementary schooling, a good head for figures, and a mechanical bent that enabled him to construct a wooden clock which worked well—and to do that after he had seen the first watch in his life. At the age of 50 he got hold of some books on astronomy and he quickly taught himself that science unaided. This process involved acquiring a working knowledge of German, classical Greek, and Latin. When Major Pierre L'Enfant was commissioned in 1791 to lay out the present city of Washington, out of all the talent available he selected this self-taught astronomer as one of his two chief assistants. That task completed, the man turned his talents to writing, becoming an editor and the publisher of almanacs in a half dozen or more of the 13 original states. He was a negro freeman named Benjamin Banneker. Any physically fit and well adjusted airman with that type of eager, gifted mind should have no trouble in rising to the occasion.

*Packaged Environment:* Since space lacks the atmosphere and pressure needed to sustain human life, it is obvious that we must provide manned missions with a medically satisfactory portable environment in which it will be possible to live and work efficiently at first for limited periods of time, then for progressively longer ones.

The answer here is an hermetically

JITTERY PATIENT. No, this rhesus monkey is not terrified at the thought of a space flight in an Aerobee compartment; he made his several years ago to an altitude of almost 40 miles and is living in carefree retirement—carefree except for these blankety physical checkups. Brig. Gen. Wayne O. Kester, former Chief of the Air Force Veterinary Service, looks on as one of his officers goes over the monkey with a stethoscope. The vet whose bedside manner fails to soothe patient is Capt. Johnie Reeves. Regular examinations are made to determine whether test animals' health has suffered from their high flying jaunts. Junior here has shown no ill effects except a passing attack of agitation when *that man* in the white coat turns up.

sealed, pressurized unit of stout construction with its own system of regenerating the atmosphere to maintain the proper amount of oxygen for keeping the air breathable. The necessity for such a system is explained by the normal chemistry of human respiration. When man inhales, his lungs utilize some of the oxygen in a breath. By the time he exhales, the air expelled has acquired a high carbon dioxide content, the rest of it consisting largely of oxygen, nitrogen, and water vapor. An accumulation of carbon dioxide exceeding 3 percent of the air volume in a sealed cabin would soon mean *finis* for a pilot and his mission. Hence the regenerating system must be reliable to hold the concentration of this toxic gas within the permissible limit of one percent.

In ordinary life on the earth's surface the proper chemical balance of the atmosphere is maintained by plant life. All green growing things depend on sunlight for the energy necessary to manufacture their essential food — carbohydrates — from water and carbon dioxide. Plants have a respiratory system and "breathe." In this process they take in carbon dioxide from the air, use the carbon in the production of carbohydrates and return the purified oxygen to the atmosphere. This process, known as photosynthesis, has yet to be duplicated by science.

In its stead, therefore, we must rely on a carbon dioxide-oxygen cycle system which is a refinement of the prototype used successfully in the two balloon Stratoflights more than two decades ago. This involves a supply of liquid oxygen or gaseous oxygen highly pressurized to be "bled" into the cabin's atmosphere at intervals and a chemical compound which not only will remove excess carbon dioxide from the air but also will have a strong affinity for uniting with moisture.

Moisture control is needed because of the water vapor component in exhaled breath as well as the water the body gives off in perspiration and other secretions. The accumulation of moisture in the air produces humidity which can become oppresive, causing discomfort to the occupant of a sealed cabin. A miniaturized air conditioner is the answer here, completing the artificial climate system.

Inherent in this system is an important limitation which will curb the duration of early missions. Because of the premium on room and weight only a certain supply of packaged oxygen can be carried for periodically replacing the oxygen consumed from the original atmosphere in the cabin at the time it was sealed and pressurized. Planning, therefore, will have to include careful calculation of the size of the supply required for the estimated time of a given mission. Any serious miscalculation could be disastrous and leave a crew in the orbit of no return alive. An emergency reserve supply would also have to be carried as a precaution against the unexpected contingencies of passage which have always recurred heretofore in the opening phases of trial, discovery, and exploration.

With an eye to the day of deeper and longer penetrations of space, aeromedical research is continuing its efforts to come up with a process which theoretically should make a cabin's sealed-in atmosphere at launch last indefinitely, thereby ending the need for carrying a supply of liquid oxygen in containers.

One method under study would be the use of the same photosynthesis operation found in nature.

Among the more primitive forms of life in the vegetable kingdom includes the algae family, found throughout the world as the chief aquatic plant in both fresh and salt water, also in certain mosses and the green film on the bark of trees. One type of algae has been discovered which performs in the laboratory like an almost ideal natural machine for photosynthesis.

This variety—*alga chlorella pyrenoidosa*—has no specific organs or functions like higher plants. Its sole operation is to create carbohydrates and release oxygen. Laboratory experiments have demonstrated that two pounds of algae can consume all the carbon dioxide a man exhales and replace it with the same amount of oxygen, indefinitely.

Indispensable to this process, however, is an adequate amount of sunlight or its artificial equivalent, and that's the rub as progress now stands. Equipping pioneer spacecraft with the necessary artificial illumination is ruled out by the bulk, weight, and power supply factors involved. Whether a means can be found to expose the algae to the right solar energy calls for actual space flight experiments.

Another drawback is that the algae must be suspended in a large amount

of water. Two pounds for example would require about 25 gallons. Furthermore the algae would have to be spread out in a thin film from 1/5th to 2/5ths of an inch thick to function, depending on the light arrangement. Thus a tank of considerable bulk would be required and we have the added problem that the algae multiplies rapidly so either additional room would have to be provided for growth or else it would have to be harvested. However, the plant is edible, contains 50 percent protein, 15 percent carbohydrate, and 25 percent fat and the original two pounds would reproduce itself often enough to supply the nutritional requirements of man indefinitely.

Space medicine does not now foresee any likelihood of oxygen-manufacturing algae or other photosynthetic vegetation being used for atmospheric stability in the opening phases of manned space flight. When larger spacecraft are developed and missions involve several weeks or months, the story may change. Any quantum breakthrough in the long quest of science for the key to artificial photosyntheses should alter the whole outlook, of course.

*Temperature Control:* Strictly speaking, space has no temperatures in the sense that we know them on earth because of the absence of any atmosphere, except for some widely dispersed gaseous clouds, to conduct or absorb heat or cold. Paradoxically, however, a spacecraft in orbit will transit regions of alternating tremendous heat and killing cold in from 96 to 135 minutes at altitudes reached to date by successful artificial satellites.

The heat and cold phenomena familiar to groundlings is explained by the action of the earth's atmosphere. As the intensely hot solar radiation passes through our surrounding envelope of air, a large part of the heat is absorbed by the atmosphere, particularly by the denser lower layers. The result is that only a small amount of the original solar radiation reaches the surface, where a portion of the heat is absorbed and the rest reflected back into the atmosphere. When night moves across the globe, both atmosphere and earth are cooled and in turn give off heat absorbed in daylight hours.

Thanks to the increasing data the artificial satellites are providing, we have tentative confirmation that temperature control for a spacecraft is, in principle, a very simple problem. Its exterior temperature from natural causes in ellipse is determined only by the amount of radiative heat which it receives from the sun, earth, or the moon, and by the heat which it re-radiates or reflects into the exterior space it is transiting. An orbiting spacecraft is not in contact with any other body from which it must be insulated, nor does its track carry it through an atmosphere of any appreciable molecular density. The solution of orbital temperature control lies in assessing these natural factors and computing the amount of artificial or mechanical assistance necessary to maintain a desirable temperature in the cabin, since there is a transference of heat to the interior from the craft's skin during part of the ellipse and vice versa during another part.

G-MAN CHECKED BEFORE Gs. Col. John Paul Stapp, veteran of medical study of the effects of violent acceleration and deceleration, has his blood pressure taken prior to a supersonic sled test run at Holloman AFB. This particular ride hit only 30 Gs; he has taken 46.2 Gs. The record, made this spring, is held by Capt. E. I. Beeding, Jr., who withstood 83 Gs with no protective equipment. This equalled about 11,620 pounds for the officer's weight.

The comfortable temperature range for an efficient space crew is between 50 and 75 degrees Fahrenheit. With miniaturized heating and refrigerating units we know such a range can be maintained, barring malfunction of equipment.

The control system has to be adaptable to three conditions—launch and escape flight, orbiting, and finally reentry.

From launch to the escape velocity of about 18,000 m.p.h. a spacecraft will hurtle through the denser regions of the atmosphere, meeting air resistance and molecular friction which will generate terrific heat at an estimated rate 70 times faster than that encountered in a supersonic jet plane. Our estimates are that the skin of the hull will have a temperature on the order of 1,000 degrees Fahrenheit. On reentry the process will be repeated and we can expect to see a returning spacecraft a glowing red when it reaches the heavy layers of the lower atmosphere.

Our basic control system concept is due for a rugged test next spring when the X-15 tries for an altitude of 100 miles (close to *Explorer III's* perigee of 117 miles) at speeds greater than 3,600 m.p.h. At peak temperature the X-15 will get as hot as a room filled with 80 home heating plants going full blast. The pilot, however, will be in an insulated capsule and refrigerated air will flow through many sections to cool system components and fluids, including rocket fuel requiring temperatures as low as minus 300 degrees F.

From data provided by the *Explorers* and *Vanguard* we have learned that although skin temperatures have swung sharply in a range of 212 degrees, interior temperatures have remained in the band of from 50 to 86, or well above the zero to 50 degrees thought probable in advanced planning.

This temperature stability in the satellites was achieved by the passive technique of coating the shell of the cone with a chemical compound which has proper radiation characteristics for reflecting solar radiation. For an entirely automated satellite that is sufficient, but once a human being is introduced into such a system the thermal balance would be affected for the simple reason that the living processes of the body generate heat. Electronic equipment in operation also gives off heat. And in a cramped compartment the combined heat so

generated can soon make things quite uncomfortable for the occupant.

That has been borne out on several stratoflights. In one made a year ago June by Capt. J. W. Kittinger, Jr., he reported his hermetically sealed cabin most uncomfortable at the peak altitude of 96,000 feet because the exterior atmosphere was too rarefied to help dissipate the heat being generated within the compartment. Besides his body the other heat sources were the system for keeping the cabin's air breathable and a large array of electronic equipment.

The astonishing gains made in miniaturizing air-conditioning equipment assures us we can prevent an uncomfortable situation like that arising in a spacecraft. Units already are available which are powerful enough to cool several average size family houses yet weigh only eight pounds.

The first human trailblazers in space will be able to regulate the air conditioning to whatever levels best suit their comfort. One is even tempted to say that when we put them up successfully they'll circuit their native planet in orbiting refrigerators.

*G Factor:* The violent acceleration necessary to get a chemically propelled rocketcraft into an orbiting ellipse would subject an unconditioned and unprotected man to gravitational or G forces a number of times his own weight. During this period, a matter of a few minutes, breathing becomes difficult with resultant chest pains, and temporary blackout occurs, bringing loss of vision or consciousness due to the lowering of blood pressure in the head and the accompanying oxygen insufficiency.

In a cabin carried by a multistage rocket, a space mission volunteer can expect to experience this intensification of G forces not only at launch but each time a subsequent stage of the rocket fires in escape flight. Moreover, even greater G forces are to be encountered upon reentry to the increasingly denser lower atmospheric layers of the earth.

To give the problem in concrete terms, the explosive acceleration of launch would immediately exert a force of 8 or 9 Gs for about three minutes. At reentry the G force would be more than doubled. There is no question today, however, that with adequate precautions a well conditioned human being has the tolerance to withstand these periods of sharp gravitational stress unhurt.

Adequate proof of that has been established by long series of experiments with high velocity rocket sleds and also with centrifuges. Col. John P. Stapp, pioneer in the rocket sled study, has hit as high as 46.2 Gs and remains medically quite fit today.

In a program now under way with centrifuges runs have been made up to 13 Gs, some lasting as long as four minutes at that force.

This series involves a trial of a new concept. The volunteers are enclosed in a water-filled capsule which covers them up to just below their eyes. A body immersed in a fluid loses part of its weight, equivalent to the weight of the fluid it displaces. The more the weight of a body is so reduced, the more the G force exerted upon it is proportionately diminished since the fluid absorbs the difference.

The four-minute runs at 13 Gs set a new record. Previously, one and three-quarter minutes for a pressure-suit-clad volunteer in a dry centrifuge had been considered the endurance limit.

This concept of "putting man in space in a bathtub," as it were, is very much in the early test stage currently and no conclusions are yet warranted. On the asset side, with a higher G tolerance for more than double the prior maximum endurance time, is that volunteers found movement considerably easier because their immersion reduced weight. Against this is the debit that no physiological improvement in comfort materialized. Subjects suffered chest pains, breathing difficulties, and finally blacked out upon reaching the same G force which would normally produce like effects.

An intriguing sidelight on the study of G tolerances is the wide gap between man and other creatures. That small pet of home aquarium hobbyists, the guppy, can take 10,000 Gs for a minute and survive. The *euglena,* a microscopic one-celled animal, can tolerate that enormous force for periods of several hours without damage. The lowly mouse is equal to 1,500 Gs for a minute. Anesthetized chimpanzees have hit over 130 Gs unharmed and will go to 230 before nearing their terminal maximum.

Just as in the past the animal kingdom has made invaluable additions to the knowledge of medical science which rebounded to the benefit of human beings, these lesser creatures may well prove upon further study to have important contributions toward facilitating man's way in space.

To recap matters as they now stand, man's physiological capability to withstand the G effects of successive violent accelerations has been demonstrated, although he cannot be expected to perform efficiently mechanical tasks during the few minutes following the launch and successive explosive velocity thrusts. As for reentry, calculations are that this can be controlled to hold the maximum G factor to 15.

Quite frankly, with existing medical knowledge and the equipment it has caused to be devised, the occupant of a rocketcraft launched tomorrow (were the feat possible) would have a fairly rugged time of it while passing through the periods of violent acceleration. He'd stand it, however, the belief is, without lasting, serious effect, and this is a good place to point out that all pioneering, in the true sense of the word, has its rugged times and rare has been the pioneer who deluded himself into thinking everything ahead would be like a bed of roses.

Since the first manned space mission is yet some distance in the future, additional time is available for research and testing which encourages us in the belief our knowledge will be greater and equipment improved by the time the maiden flight vehicle stands on the launch pad.

An important thought to bear in mind is that aeromedicine's present preoccupation with G tolerances as an important factor, physically and mentally, promises to be transitory. Once existing chemical systems are supplanted by propellants obviating the need for violent and spasmodic thrusts of acceleration—and developments along this line are anticipated—the G factor will dwindle in significance because the acceleration to orbital velocity of about 18,000 m.p.h. will be gradually attained.

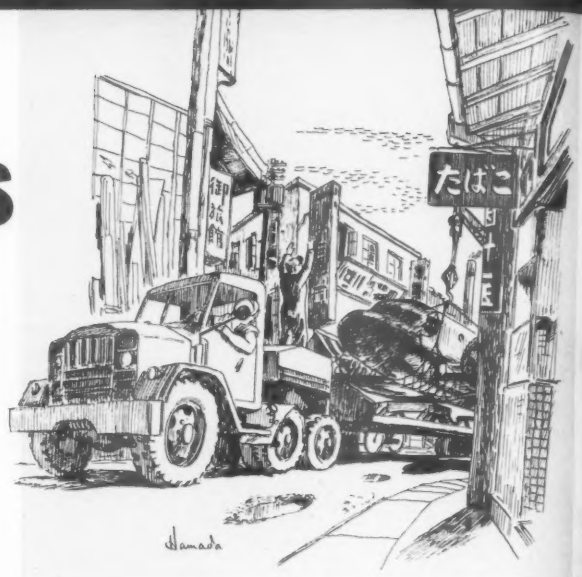
*(Next month*—Orbiting Man's Problems)

# Get-It-Done Guys

*No job is too large, too small, or too tough for NAMAP's Area Assistance teams.*

by S/Sgt. Gerald A. DuBois, *Hq. NAMAP*

Illustration by Kenjiro Hamada




On an Air Force base somewhere in the Far East not long ago two men equipped with special tools crouched beside a safe, studying the gleaming dial.

"Do you think we can crack this one, Joe?"

"It won't be as easy as the last job, but I think we can punch her."

"Hand me the drill and crowbar."

"How are the tumblers?"

"They sound O.K."

"Alright let's give it a whirl."

Then, suddenly and unexpectedly, an air policeman happened by and overheard the conversation. Entering the office he drew his gun and apprehended the GI "Jimmy Valentines."

"This is our job," they protested. "Look, here are our passes. We work for the Northern Air Materiel Area, Pacific (NAMAP) Area Assistance Division."

A fictitious story? Yes, but not fantasy.

The long title belongs to a unique organization that handles seemingly impossible jobs—everything from safe cracking to mountain climbing—and gets them done quickly and efficiently.

NAMAP's Area Assistance teams are "get-it-done guys." Their record of accomplishments speaks for itself. In Korea, for example, the men on K-16 were rationed to an eight-hour water supply because of a defective pump. After sweltering in the summer heat and Korean dust, they sweated out long lines to take a shower during the limited eight-hour period. An Area Assistance team was called in. In short order they flew the defective pump to Tachikawa AB, Japan, had a new one cast in one of NAMAP's shops, flew it back to K-16 and installed the new pump before the men ran out of water.

On Japan's Misawa Air Base, on the northern tip of Honshu, our F-84G pilots were experiencing difficulty in retracting the landing gear because of a defective part. Something had to be done about it quickly since our combat efficiency in this strategic area was seriously impaired. However, normal supply requests disclosed that no F-84G replacement parts were in stock anywhere, not even in the states, since Republic was no longer producing the model "G" F-84.

Shortly after Area Assistance was called in they airlifted a working sample part to NAMAP's 2712th Equipment Repair Squadron. In just four days enough parts were manufactured for all the aircraft at Misawa with an ample reserve of spares.

When a "Gooney Bird" crashed into the Tamagawa river near Tachikawa, personnel at the air base promptly named the sunken C-47 "Tamagawa Cruiser," and local wags made jokes about it. But getting the "cruiser" out of the shallow waters of the Tamagawa and back to the base was no joke. It presented a real problem and again Area Assistance was called in. They fished the "Gooney" out easily enough, but getting it home was a problem. Partly disassembling the bird, they maneuvered it through narrow roads. After numerous stops and starts and scraping of fragile Japanese houses on both sides of the way, they brought the C-47 back to base.

No project is too difficult for Area Assistance Division. They have furnished mountain climbers for a "plane-strikes-mountain" accident as well as deep sea divers for a C-124 *Globemaster* that dived into Korea's Hon River.

Individual problems also receive prompt personal attention. When Lt. James E. Sanford broke his ankle playing football, he took his problem to AA because he didn't want to spend the rest of the season warming the bench. They made a plaster cast of the weak ankle, then manufactured a special plastic support. The lieutenant returned to the gridiron to play the rest of the season.

Regardless of type or scope of problem it receives, the Area Assistance Division researches, coordinates, and furnishes required assistance promptly. Its field liaison office serves as NAMAP's contact on maintenance problems for all U. S. Navy, Army, and Military Assistance Advisory Group units in Japan, Korea, and Iwo Jima. Routine requests are routed through channels. The seemingly impossible problems are referred to Area Assistance.

Teams go out periodically to "look for trouble." On the average, about 65 of the organization's specialists are usually on TDY. An Area Assistance team visits every NAMAP base each six months for problems that no one else can solve. And then it goes right ahead and gets the job done with efficiency and with dispatch.

Wisconsin's A/1C Linda Williamson and Edinburgh's leading Aircraftwoman Jan Howell enjoy a stroll through centuries-old English town.

# *Cherchez la* WAF

## THEY DON'T FLY THE PLANES OR PUSH THE BUTTONS, BUT YOU'LL FIND THEM ON ALL KINDS OF JOBS IN ALL KINDS OF PLACES.

**by Capt. Ted R. Sturm**

LIKE THE lifetime resident who knows less about his hometown than does the itinerant tourist, most Air Force men would stammer over a few basic questions about their female co-workers called Women in the Air Force.

Perhaps this is understandable. After all, the WAF comprise less than one percent of the total USAF strength; which means the odds are about a hundred to one that a male airman will ever work with a WAF.

Still, a lack of knowledge of these important Air Force members is not only a deficit in an individual's "Air-Q" but can actually prove embarrassing. Take the captain who hit the panic button when a 17-year-old blond asked him if he thought she should join the WAF.

She was sitting beside him on the bus, glancing from his uniform to the copy of THE AIRMAN he was reading. It was the February issue and the girl was eyeing the picture of two WAF on page 10.

Like spring, she busted out all over.

"Captain, do you think I should join the WAF?" He laughed and it was the wrong thing to do, because evidently he mistook teen-age fervor for levity.

"Honest I've been thinking about it, but I haven't said anything to mom or dad. Would I really be stationed in places like England or Germany?"

Losing the equanimity which should be the stock in trade of all Air Force captains, he stammered a few things like "Uh, sure . . . I don't know . . . it all depends," and "see your Air Force recruiter."

But this girl was really serious—and obviously the captain didn't know very much about the WAF.

"Look," he finally told her, "if you really want to be a WAF, the best place to find out about it is at the recruiting office."

"Oh, I've been there," she countered airily, "but I can't quite believe all that. I mean, really, the beautiful girls in snazzy uniforms they have in those booklets—after all!"

But she need not have been so dubious.

In Europe, approximately 250 WAF are veritable answers to the girl's questions — snazzy uniforms, foreign travel, and all. In Hawaii, 50 more could vouch for the travel op-

A/2C June Bennafield, office manager of the NCO Preparatory Training School at Westover AFB, Mass., discusses her work with Col. Emma Jane Riley, WAF Director, and Squadron Officer Kay Bright, WRAF exchange officer assigned to Colonel Riley's office in the Pentagon.
*Photo by S/Sgt. Harry Shields*

portunities claimed by recruiters and in England, Women in the Air Force could furnish the girl with 100 "yesses" to her question, "Should I join the WAF?"

### And Why Not?

Regardless of how you put the question, the answer always comes out the same way: if a woman intends to work until, after, or whether or not she gets married, she could hardly choose a better place than with the Air Force. Which forms the basis for a unique, mutual admiration society, for the Air Force feels the same way about its women.

Yet like the perplexed captain, most male members are inclined to take the women for granted; and the worst thing the male animal can do, is take women for granted.

This routine acceptance of the WAF is really complimentary. It is indicative of the way in which the WAF perform their daily work; unobtrusively and as an integral, homogeneous part of the Air Force family.

The figures (mathematical) are constantly changing, but now there are roughly 8,000 women wearing WAF uniforms. These girls have managed to get themselves to such glamorous places as Paris and Puerto Rico—as well as Germany, Hawaii, England, and Texas. They work at all kinds of jobs from typing letters to repairing magnetron circuits in radar sets, and many WAF are flying today aboard the transport aircraft of MATS.

The important thing for the WAF is, that they are considered in the same category as all airmen when it comes to assignments, promotions, pay and allowances, and — surprisingly enough — retirement benefits.

One unique aspect of their assignment, however, is the fact that effectively, each WAF belongs to two organizations. For housing, administrative and logistical support, they are attached to a WAF squadron section in most cases. Then they are assigned to operational squadrons and units throughout the base, where they perform their duties.

Naturally, there are a few assignment restrictions for WAF. By law, they cannot be assigned to combat duty, and by common sense, work which is beyond their physical capabilities is out. It is amazing, however, how many jobs they can do and are doing. Again, because they are not considered "special cases," figures are not exact, but the largest numbers of WAF are engaged in the administration, communications, and transportation career fields. The balance work at such jobs as personnel, supply, medical, finance and accounting, statistical analysis, weather, and others. In fact, of the 43 enlisted career fields, 32 are open to WAF. For officers, 17 of 21 career fields are open for the women.

### Retirement?

Somehow, the thought of a retired servicewoman seems incongruous. The phrases "retired colonel" or "retired sergeant" usually conjure a mental picture of a somewhat portly gentleman with an appropriately grizzled look, raising chickens on a small farm.

Yet thousands of women in civil service, the business world, teaching professions, and so forth, are career minded. They work at their careers whether they are single or married. It follows then, that the advantages of an Air Force career are as attractive to women as to men. And considering civilian wage scales for women, the benefits are even more attractive.

Take the example of advancement opportunities. An enlisted career can take a WAF from airman basic through master sergeant and into the warrant officer bracket. Or, at any time after basic training, she may apply for USAF Officer Candidate School. After six months' OCS training, she becomes a second lieutenant.

There are three other paths open to a commission. One is through the Air Force Reserve Officer Training Corps, which is conducted for women at 10 colleges throughout the United States. A second avenue is via the direct-appointment route. For this, an applicant must be a college graduate between the ages of 21 and 34 years. The third path is a recently opened channel through the Civil Air Patrol.

This third path leads to OCS. For enlisted WAF the OCS requirements include a high school diploma and one year of active duty with satis-

Procedures of eye tests are explained to A/1C Drexel Storer by medical technician A/2C Maria Mercado.
*Photo by M/Sgt. Hal Ward*

factory ratings. For civilian OCS applicants, two years' college is mandatory. Civil Air Patrol cadets are considered as civilian applicants, but the two-year college requirement is waived in lieu of a CAP certificate of proficiency. Effectively, this puts CAP cadets on a par with enlisted WAF as far as OCS attendance is concerned.

In all cases, candidates for commissions must have high moral and personal qualifications which are determined by written references and personal interviews.

This follows the general criteria for enlistment. The Air Force accepts only carefully selected volunteers, epitomized in the qualification standards for enlistment. A potential WAF must be a high school graduate, or pass a general education development test. Her scores on mental and physical tests must be higher than those required for male airmen and additionally, she must pass the Armed Forces Women's Selection Test. After that, and the inevitable basic training at Lackland AFB, Tex., she advances according to her effort and ability.

### And Then the Schools

Any girl who seeks the Air Force as an escape from the three Rs is in for a surprise. The Air Force has all kinds of schools and most of them have a place for embryonic female technicians. It isn't often that women skilled in the intricacies of radar circuits walk into a recruiting office.

But Air Force schools are fun and they certainly offer a variety in curriculum and geography. At Lowry AFB, just outside Denver, WAF learn photography. In Illinois, at Chanute AFB, they study weather observing, parachute rigging (they don't have to jump in the 'chutes they rig), and instrument trainer repair.

At Sheppard AFB, on the edge of the heart of Texas, WAF are transformed into intelligence specialists, finance clerks, and accounting, statistical, and machine accounting specialists.

In between shrimp boats at Keesler AFB, Miss., the girls become radar and radio mechanics or radio operators. Can you beat all this at Podunk's Vocational Training School?

Schools are just the beginning, however, and really a small part of a WAF's life. When she joins an operational unit, she really becomes a working part of the operational Air Force. The WAF were made a permanent part of the USAF in 1948. This finalized a trend which really began during World War II with its fantastic shortages of skilled manpower—a shortage from which the Nation has not yet recovered.

The Women's Army Corps consisted of about 100,000 women of whom 40,000 served in the Air Corps. The bulk of this group formed the nucleus of today's WAF. And before you emulate the bus-riding blonde by saying, "I can't believe all that," visit a few of these WAF on the job today.

### In Wiesbaden

Capt. Eleanor Garvin, along with her first sergeant, M/Sgt. Mary Omachel, run the WAF Squadron Section on Lindsey Air Base in downtown Wiesbaden, the Spa City on the Rhine. The WAF live in quarters which provide single rooms for first-three graders and private rooms housing two or three girls each. There is a dayroom, a visitors' lounge, an art room where the girls take off-duty music and painting lessons at their own expense, a kitchen, and laundry facilities. Fifty of the 200 WAF are married and live off-base with their husbands.

This is home for the WAF of USAFE Headquarters. Their places of duty are as diversified as the hometowns from which they come. T/Sgt. Carol Platts, for example, is from Detroit, Mich. She works as a team chief and shift supervisor at the 25th Communications Squadron. Part of her job includes conducting regular classes in procedures and codes for teletype transmission. Much of her free time is devoted to Girl Scout work with both Americans and Germans.

The NCOIC of Flight Scheduling at Wiesbaden Air Base is S/Sgt. Pat M. Quinn, from Eugene, Ore. Besides arranging many emergency search missions, she has been in the big middle of projects like *Operation Kinderlift*.

A traveling member of the squadron is M/Sgt. Virginia L. Hodges, from Royal Oak, Mich. As a member of the 7122d Support Squadron, (Armed Forces Radio Service—TV) she continually makes inspection trips of all AFRS stations throughout

At Carswell, A/3C Ruth Benson adjusts an enlarger as she performs duties of an apprentice still photographer.
*Photo by T/Sgt. William G. Tretinik*

Europe, North Africa, and the Middle East.

These are some of the WAF in Wiesbaden. They work and live as WAF do everywhere, in the States and overseas. And like most Americans—male or female—they have their helping hands in local worthy causes. In Wiesbaden, they sponsor an orphanage and a local home for the aged.

### Hollywood, Too

Claire Kinney is an airman second assigned to the medical supply section of the 416th USAF Hospital at March AFB, Calif. She is married to A/2C Edward Kinney—and the marriage is almost as new as her second enlistment.

Last December she reenlisted three days after her fiance. In February the Kinneys were married. After a 30-day honeymoon in Hollywood and at Laguna Beach, Calif., they settled in a Riverside community neighboring March AFB. Claire's story, tinged with all the elements of romantic fiction, illustrates the typically American life the WAF lead in uniform. Why did Claire reenlist?

"I like the pleasant work and associates, the close-knit amenable society of the Air Force, and the travel and educational opportunities," she says.

It's as simple as that.

A/2C Anna K. Kahler is the only WAF in the 315th Air Division in Japan. She attests to the human understanding of the Air Force, because she was transferred there last November to be reunited with her husband, A/2C John Kahler. (John outranks Anna by three months.) The two met in 1956 at Scott AFB, Ill., where they were attending personnel school.

For many WAF, the balmy climes of the Caribbean form the setting for work and play. And in Hawaii, the girls enjoy the beaches of Waikiki. It doesn't really matter where a WAF is stationed, the work is interesting and rewarding, the food is good, and there is ample opportunity for recreation and education.

And really, those *snazzy* uniforms.

When a girl joins the WAF, she gets an initial issue of uniforms plus a cash allowance for purchase of lingerie and dress pumps. After six months of service, WAF are eligible for an annual maintenance allowance for the replacement of uniform items.

But that's only part of the uniform story. For nonconforming female fashion rebels, the Air Force is the perfect out. While "snazzy" might throw the dignity of staid uniform-regulation writers for a loss, there is little doubt that the uniforms are smartly tailored, distinctive, and flattering. They don't change as the House of Dior wind blows, so the girls are always in style. Besides, they can slip into "civvies" during off-duty hours and if you *are* of the Christian D. School, there's always a spare parachute lying around.

### One Who Knows

From her office in the Pentagon, WAF Director Col. Emma J. Riley (who has spent 16 years in the military), monitors the assignment and general welfare of the WAF.

For the WAF and the potential WAF she summed up the women's important responsibilities and opportunities in the Air Force when she said:

"As members of the United States Air Force, we enjoy the wonderful opportunity of sharing in the defense of our country and the preservation of peace in exceedingly troublous times. We can make the best of this opportunity only if we strive unceasingly to improve our knowledge, raise

Offutt is where A/2C Joan McDowell utilizes her drafting skills to prepare visual presentations.
*Photo by A/1C Eugene Pluska*

our skill level, and work to the best of our ability.

"Interesting careers, increased responsibilities, pleasant environment, smart uniforms, and good pay may have motivated many of us to join the Air Force. These factors, important as they are, do not reflect what being in the Air Force means to the majority of WAF. Rather, we derive satisfaction from being an integral part of the great Air Force family that, through cooperative teamwork, has advanced airpower from yesterday's limited horizons to the stratosphere of today and will pioneer tomorrow in the unknown ranges of space.

"We do not fly the planes nor push the buttons. Still, we take tremendous pride in the achievements of those who do, knowing full well that in some small but vital way, we contribute to successful missions.

"To the potential WAF, I say, if you want something more than recognition and money in a career; if you are intelligent and eager to work; if you can put the welfare of the many above your own desires; if you look eagerly toward the future, you qualify for duty in the Air Force. You will enjoy helping the fine men and women who, under the direction of great, imaginative, wise, and understanding leaders, support, maintain, and operate the United States Air Force."

# SLANTS ON SPACE

"That's right, untrained and no experience, but I have nothing, *ABSOLUTELY nothing,* to UNLEARN."

ESCAPE VELOCITY and orbital velocity for a satellite or spacecraft are not synonymous, although quite a few civilian informational media have been using the expressions as if they meant the same thing.

Manmade satellites launched since the first was put in the skies last October have had orbital velocities which were at times alternately greater and less than the required escape velocity of some 18,000 miles per hour.

The speed of a satellite coursing through its ellipse is not constant. As it swings through the perigee arc taking it nearest the earth, our planet's configuration exerts an extra gravitational pull which has an accelerating effect. This is most marked when a perigee happens to be above the geographic equator.

At the geographic equator the earth has a diameter of almost 8,000 miles. It will be obvious that if an escape velocity of some 18,000 m.p.h. were maintained, satellites would be completing orbital circles of the planet better than twice an hour. Actually the fastest transit on record at this writing is a bit over an hour and a half—to be exact, the 96.2-minute initial orbit time reported for the now defunct *Sputnik I.* This satellite had a relatively "tight" ellipse, in terms of distance from the surface, with a maximum altitude (apogee) of 560 miles and a minimum (perigee) of 145 miles.

For the longest transient time the blue ribbon, as this issue of THE AIRMAN goes to press, still belongs to *Vanguard I.* When it first got into ellipse the perigee was 407 miles; the apogee, 2,513 miles.

An analysis of the initial performance of *Explorer III* offers a good idea of how orbital velocities vary. The original perigee of 110 miles and an apogee of 1,738 miles gave it a circuit time of some seconds over one hour and three quarters. From these figures it is possible to compute the approximate circumference of the ellipse traveled, which was 30,700 miles per orbit. Further calculations establish the satellite's velocity at its highest altitude as about 13,470 m.p.h., and for the lowest altitude approximately 18,850 m.p.h.

Thus the velocity ranges in this case from a low of about 3.7 miles per second to a high of 5.26 m.p.s., with the average a shade less than 4.48 m.p.s.

Perigee and apogee apply only in ellipses about our planet, the second syllable of the terms deriving from the Greek word for earth. In a circumsolar ellipse the terms become aphelion and perihelion. With the planet Jupiter, the variant becomes apojove, etc.

☆ ☆ ☆

Talk of putting a future satellite or spacecraft into an orbit which would be either a perfect circle or nearly so will get you a dubious look from eminent scientists. They do not say it can't be done for, theoretically, such a feat is within the realm of possibility. They will explain, however, that a perfect circle is merely a single form of an ellipse and the number of forms of an ellipse is considered infinite, mathematically speaking. Hence, to bet a perfect circle will be achieved is playing a long shot with the odds against you infinity-to-1.

On this subject scientists further point out that of all the known heavenly bodies which orbit not one moves in an ellipse perfectly circular. Within our solar system, whose confines are not likely to be crossed for many years to come (if at all), only one of the nine major planets has something like a partially circular orbit around the sun. This is Venus whose aphelion and perihelion distances differ only a little over 900,000 miles. With the other planets, the variations in orbital distances range from a few million to almost 4.6 billion, the latter in the case of Pluto which is 4.6 billion miles from the sun at the most distant point in its ellipse and 2.76 billion miles at the nearest.

By getting a satellite into a perfectly circular orbit, scientists declare, man would be achieving something not to be found in the celestial order of the Universe, as presently known.

☆ ☆ ☆

Modern astronomy's knowledge of our solar system, that 1/100,000,000 component part of our parent galaxy—the Milky Way—is still quite limited. Good index: It was not until 1956 that astronomers finally established how long Pluto, the outermost planet, takes to rotate on its axis. Answer: Six days.

☆ ☆ ☆

Anyone inclined to regard Arabs as unscientific or lagging people should be reminded their contributions to astronomy have been significant. A check of any compilation of star names will show that almost two-thirds of them are Arabic in origin. The ancient Greeks are a poor second, accounting for one-sixth of the existing star names, while the Romans make a sad third with only one-sixteenth to their credit.

—WILLIAM A. KINNEY

# BE PROFES

by General [illegible]
Vice Chief of Staff

EFFICIENT OPERATION of the United States Air Force depends largely upon the professional manner in which each airman—enlisted man and officer—performs his individual job.

Regardless of what your specific duty assignment is, whether you are directly or indirectly responsible for the operation of our aircraft or missiles, a professional performance on your part is required for success of the Air Force mission.

To insure professional performance, the Air Force Chief of Staff, General Thomas D. White, recently ordered major commanders to examine all personnel quality control measures and "insure that the best (persons) are rewarded and the ineffective are eliminated."

The quality control program will apply to officers and airmen alike. It is going ahead on a priority basis. As General White recently stated: "Only through this strict control can we promote the more deserving and eliminate from the service those who are not contributing to its effectiveness. . . . It is incumbent on all commanders to raise our sights and achieve the highest standards possible and maximum effectiveness in everything we do."

WHAT CONSTITUTES a professional performance?

Professional performance by flying personnel means strict observance of the cardinal rules of air safety: adequate preparedness, thorough flight planning, constant alertness, rigid adherence to standard operating procedures, safety consciousness at all times, and a thorough knowledge of emergency procedures that will enable pilots and crews to react automatically and in time when an emergency occurs.

For maintenance personnel, it means dependable quality maintenance and meticulously thorough preflight inspections that insure "safe-to-fly" aircraft for aircrew personnel or "ready-to-launch" missiles.

Professional performance in operations means intelligent organization and proper supervision in all phases of training and scheduling of aircraft or missiles and crews for accomplishment of assigned missions. It means insuring that individuals assigned to operations are well disciplined, that the operations office is efficiently organized, and qualified personnel are immediately available or on call.

Professional performance also means informing and co-

# FESSIONAL

eral [illegible]s E. LeMay
Chief of Staff, USAF

ordinating with all supporting sections on every mission, utilizing flying time for maximum training, and conducting thorough briefings in accordance with regulations. It entails rigid standardization checks at proper time intervals, full support of training programs, keeping the commanding officer informed of discrepancies or problems that could conceivably retard full mission accomplishment, seeing to it that appropriate checklists are available at all assigned aircraft and missiles, posting NOTAMS at base operations daily, enforcing regulations for control of airdrome traffic, maintaining good liaison with AACS and weather personnel, strict enforcement of flying discipline, and looking closely at every operations plan to see if there is any borderline planning and whether some items should be eliminated or modified from the safety standpoint.

CHARGED AS IT IS with the primary responsibility for the air offensive and defensive operations of the Nation, our Air Force is in deadly serious competition with the airpower of a nation whose leaders seek our downfall.

Despite recent Soviet gains in aircraft and weapons technology, however, the U. S. Air Force still possesses a relative margin of superiority. This is largely due to the fact that we have more highly trained professional personnel. We can maintain this favorable margin of superiority only so long as we have unquestionably dependable maintenance and equipment, and combat air and ground crews possessing the highest degree of professional skill attainable through constant training and practice.

The importance of doing your job in a professional manner cannot be overemphasized. Whatever position you play on the Air Force team—whether you are a tail gunner, member of an aircraft or missile maintenance crew, copilot, aircraft commander, flight engineer, tower operator, supply officer or an administrative specialist, the efficiency of the Air Force depends on how well you perform that job. The slightest deviation from high professional standards can seriously impair our combat capability.

The efficiency of the United States Air Force is today a key factor in the security of our country. We can be proud of our record thus far in discharging that responsibility. By performing your job in the most professional manner you know how, you can insure that our Air Force will continue to be second to none.

# MISSILES ON TAIWAN

***Pax per Vim*—Peace through Strength—is the motto of the 17th Tactical Missile Squadron.**

"T minus . . ."

In the missile operations center of the 17th Tactical Missile Squadron, Capt. J. F. "Joe" Burns ticked off the "count-down," giving the minutes before a *Matador* missile's takeoff time.

"T minus . . ."

On the launching pad the squadron's missilemen moved swiftly through what seemed confusion, but what was actually a well planned, carefully controlled drill.

"T minus . . ."

A giant crane deposited a sleek *Matador* guided missile on its launching cradle.

"T minus . . ."

Silver wings flashed in the bright Taiwanese sunlight as a crane settled them down to the body of the missile where S/Sgt. Richard L. Gazer, Rhinebeck, N. Y., and A/2C Fredric Wolfe, Altoona, Pa., caught the edges and guided them expertly into place.

"T minus . . ."

At the same time A/2C Richard L. Bibb, Cincinnati, Ohio, and A/1C James A. Warth, New London, Iowa, brought the missile's nose cone up the launcher ramp to connect it to the body.

The count-down had worked down to less than a minute before takeoff.

"T minus 30 seconds!"

The crew moved back. Capt. Cecil J. Halbert, the launch officer, pressed the button on the fire control box that started the jet engine in the missile. Hot gasses shot from the tailpipe. A cloud of dirt boiled up from the edge of the launch pad. Nearby, two Chinese farmers, tilling rice in an age-old manner, stopped in their paddy to watch the antics of this symbol of the coming space age.

"T minus five seconds!"

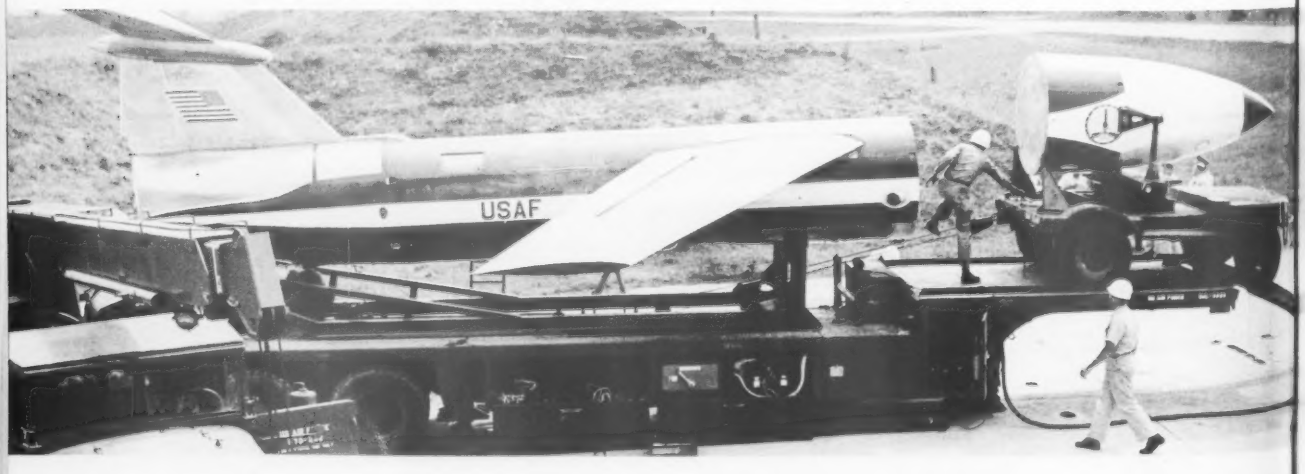
And then: "T minus 0!" It was takeoff time.

But instead of blasting off, at the exact split second of T minus 0, a T-33 jet flashed over the missile so low that the two seemed to rub together.

The radar antenna of the *Matador's* guidance system spun, catching the jet and directing it through a complicated electronics system just as if it was the missile itself disappearing into the distant haze.

Captain Halbert touched another button on his fire control box and the whine of the *Matador's* jet engine died out. The Chinese farmers turned

Pacific Air Forces' missilemen on Taiwan rapidly assemble a TM-61 Martin *Matador* during a practice "count-down."



back to their water buffalo-pulled wooden plow and the missile crew started to dismantle its "bird."

This was a training exercise for missilemen of the 17th Tactical Missile Squadron, the first guided missile unit assigned to the Far East. While this and other exercises through which the missilemen maintain proficiency are training projects only, it is training done under a sense of great urgency.

The 17th is located in a country that is technically at war with the Chinese Communists on the mainland —this is a war that occasionally stops being technical only and becomes hot. The attack and evacuation of Tachen Island was an example. (See *Top Cover for the Tachens,* June issue.)

As the 17th missilemen "countdown the bird" there is a constant whine of Chinese Nationalist jets overhead, flying a protective cover for the island stronghold. Guards, foxholes, and air raid shelters are everywhere. Taiwan—Nationalist China—has its very existence threatened by the increasing build-up of Communist strength on the Chinese mainland. The Communists are held back from seizing the island only by the deterrent force represented in the combined strength of the military forces of Nationalist China and the U. S.

*Matador* guided missiles were introduced into Taiwan to increase this deterrent force.

The first missilemen and TM-61 Martin *Matador* missiles arrived on Taiwan in April 1957 in token force only. This was rapidly expanded to full squadron strength later.

Taiwan is under a war economy. This austerity is reflected in the facilities the missilemen found available to them. The 17th lives and works under field conditions.

A Chinese Nationalist air policeman stands guard beside a Martin *Matador* TM-61 guided missile on Taiwan.

When the squadron arrived it was quartered in a cluster of bamboo huts, famous primarily for their natural "air conditioning." These are now being replaced with more comfortable —if less picturesque—prefab units.

On the door of one of these bamboo huts, someone has stuck a decal of the type often seen on automobiles in the States. It reads, "We are an Air Force Family."

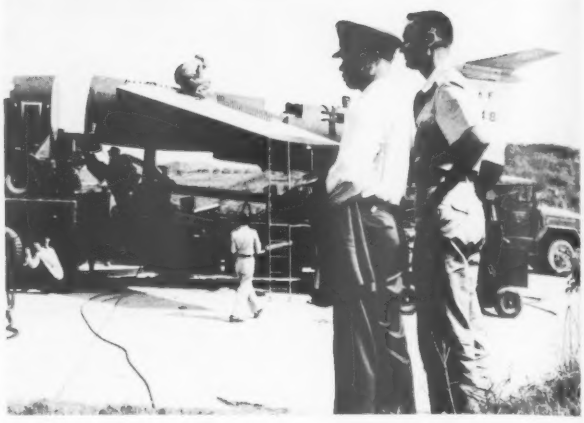
It was done as a joke, but it happens to be true.

The 17th Tactical Missile Squadron was activated in September, 1955 at Orlando AFB, Fla., the fourth *Matador* squadron established in the Tactical Air Command. Many of the men who were with it then are still

Brig. Gen. Fred M. Dean, MAAG-Taiwan, talks with Capt. Cecil J. Halbert (center), a 17th Tactical Missile Sq. launch officer, and S/Sgt. Jack L. Ice, launch crewchief.

Thai "omen" hay-cutters go calmly about their work as a C-124 disgorges a 17th TMS *Matador* to be displayed in Bangkok following a two-thousand-mile flight from Taiwan.

Capt. John J. Estrada (left) explains the *Matador* control panel to a Chinese Nationalist Air Force officer. The panel is used to fire the *Matador*.



A Chinese Nationalist Air Force officer (left) and Mr. K. R. Park, technical representative of the Martin Aircraft Company, watch a 17th TMS launch team assemble a "bird."

"counting-down the bird" with the squadron today. The newest assignee has been with the organization for at least two years.

This long association has built the 17th into a close knit organization that can well be termed "an Air Force family" as the decal on the hut door proclaims.

Before being sent to Taiwan, the 17th underwent rigorous training. Just prior to embarking, the squadron went to Cape Canaveral, Fla., where the missilemen dug in, pitched tents, and simulated field conditions while making live firings of the *Matador*.

On Taiwan their work so far has been to build up their missile base, locate their launching pads, and to assemble and test their "birds." Occasionally there is a break in the routine of their work. In March the squadron made a count-down of a *Matador* for a gallery of Far East reporters—the first time the missile had been publicly displayed in the Far East area.

Then on March 27, a launch team headed by Capt. John Carroll accompanied a *Matador* to Thailand when the Thai government invited the U. S. Air Force to display one in Bangkok during Royal Thailand Air Force Day.

Commander of the 17th Tactical Missile Squadron is Lt. Col. Frank P. Dannelly, a veteran of 12 years in USAF missile work since he was assigned to the 1st Experimental Missile Group in 1946. He is now one of not more than 20 men who have been with the missile program since its inception.

Although trained by the Tactical Air Command, upon its arrival on Taiwan the 17th Tactical Missile Squadron became an operational unit of Pacific Air Forces, commanded by Gen. Laurence S. Kuter. The 17th is under the direct control of Air Task Force 13, a subcommand of Pacific Air Forces' 13th Air Force.

Air Task Force 13 is commanded by Brig. Gen. Fred M. Dean. Although General Dean doubles as Chief, Air Section, MAAG-Taiwan, the 17th Missile Squadron does not come under the military advisory group.

It is a special tactical unit which takes its orders through a chain of command extending directly to Pacific Air Forces.

It is in the Pacific solely to increase and keep modern the deterrent strength that dampens Communist expansion ambitions.

In this respect the motto that appears on the missilemen's insignia sums up the guiding spirit behind the entire defense philosophy in the Far East.

It reads, *"Pax per Vim"*—Peace through Strength.

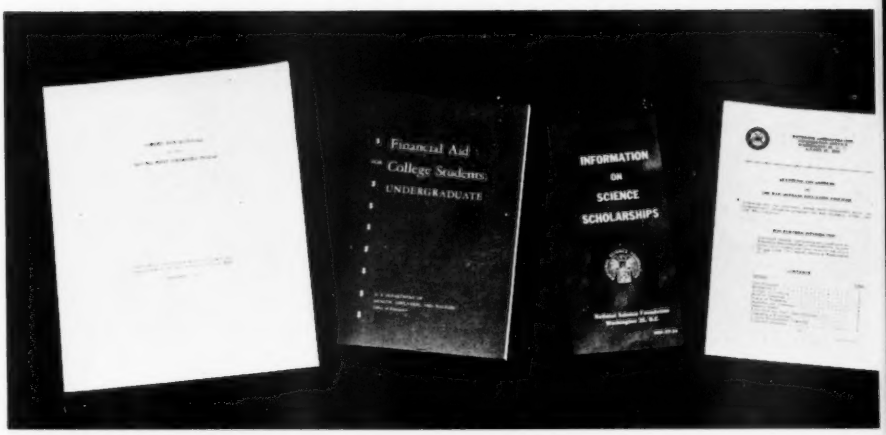
Today Pacific Air Forces has the air defense responsibility for 40 percent of the world. The 17th Tactical Missile Squadron is a new addition to this command's deterrent strength—a warning to Communist forces that aggression will not be profitable.

Missilemen of the 17th TMS are presently living in these Chinese bamboo huts while more comfortable—but not so picturesque—facilities are being constructed.

# There's A SCHOLARSHIP

by M/Sgt. Hal Bamford

**America's advanced educational system harbors a multimillion dollar annual windfall.**




PROBABLY no boom in the history of the United States has quite equaled the current reawakening in the many-faceted field of education.

The teacher shortage has been the subject of dozens of studies by a multitude of government agencies. (See, *New Career for "Old" Airmen,* July '58 issue.) Professional education associations, state organizations, and parent-teachers groups are constantly striving to find new and improved methods and facilities.

Yet, with all the publicity which has spotlighted the field, many parents are still faced with the problem of finding the financial means to put junior or sis through college.

Invariably, financial problems are the biggest stumbling block on the road to advanced education. Rocketing costs of living and the very nature of military life often catch the professional airman unawares. Meanwhile, back at the college, the school administration is trying to determine why more requests aren't made for the millions of dollars available for the specific purpose of financial aid.

Collected information reveals more than $100 million, in the form of scholarships, grants, and loans, is available every year to the college students of this Nation. And Congress is now considering a new Federal scholarship plan which would add appreciably to that total.

The majority of scholarships are available to students from any walk of life who can qualify. But the qualifications vary considerably because some are administered by the colleges' governing bodies; some by the National Merit Scholarship Corporation; some by industries; and some by individuals.

Air Force parents who are facing the educational financial problem headon should investigate them all, but two specific avenues are tailor-made for USAF personnel—the Henry H. Arnold Educational Fund, and the War Orphans' Educational Assistance Act of 1956.

The Arnold Educational Fund is administered by the Director of the Air Force Aid Society. While it has limitations because of the amount of funds available annually, the fund has never, to date, been fully utilized.

Under this assistance program, priority is given to sons and daughters of Air Force and Army Air Force personnel who died on active duty or while in retired status. Other children eligible are those of active-duty and retired Air Force personnel, and children of Air National Guard and Air Reserve personnel on extended active duty with the USAF.

The important point to remember is that the maximum number of annual scholarships has never been utilized. Administering officials estimate that the current fund level will support approximately 200 scholarships each school year. During the year which just closed, 124 were awarded. This number included 13 children of deceased personnel, 18 of retired, and 93 from families where a parent is still on active duty.

The Arnold fund establishes no blocks to school of choice providing that the school is accredited. They do request, however, that discretion be used to avoid selecting a school where matriculation fees are above average when an equal education may be obtained from a school which has more economical costs.

Most Arnold fund scholarships are granted on a combination loan-grant basis. However, the assistance may take the form of either a loan or a grant, as well.

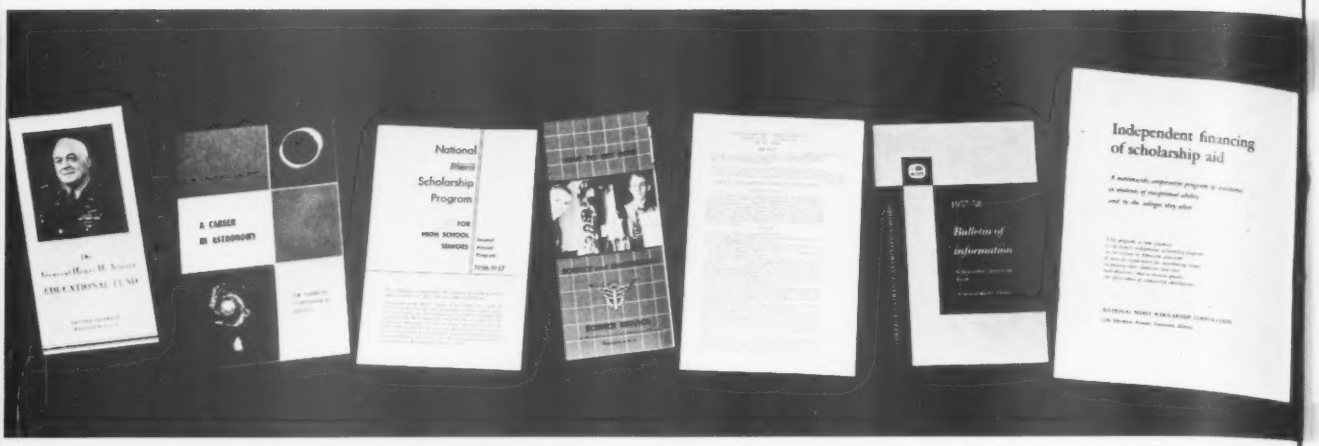
Repayment records have been remarkable in the past and are classed as "near perfect" by fund administrators. Average value of scholarships has been slightly above $400, a bit above par with those of most colleges.

At present, a three-member committee, headed by the Director of the Air Force Aid Society, evaluates applications for scholarship assistance from the Arnold Fund. Professional assistance in screening applicants has not been solicited although it may be in the future if selectivity becomes a major problem.

Applications for assistance for the entire school year must be received in Washington no later than July 15, or, if only for the second semester, by December 1. The applicant must also have applied for admission to the accredited school of his choice. If application for assistance is made for any portion of the freshman year, he will be required to take the Scholastic Aptitude Test administered by the College Entrance Examination Board, Box 592, Princeton, N. J.

All assistance application blanks should be requested from the Director, Air Force Aid Society, National Headquarters, Washington 25, D. C.

Prospective students may also qualify for assistance under the War Orphans' Educational Assistance Act, Public Law 634, 84th Congress, ad-




ministered by the Veterans' Administration. It is limited to educational assistance for children whose education was "impeded or interrupted by reason of death of a parent from military causes" in World Wars I or II or the Korean conflict.

Unlike the Arnold fund rules governing school selectivity, the stipulations of the VA-administered PL 634 schooling are not quite as generous. Applicants must be counseled by VA-employed educational advisors prior to entry into any college training. Recommendations concerning courses of study are made from test results.

If the applicant insists upon entering a school or course of study against the advisor's recommendation, he is free to do so. However, should he fail in his undertaking, future aid will be dependent upon following the original advice.

Other requirements under the bill are standard. Parents of eligible children should establish direct contact with the Veterans' Administration to obtain complete details.

Any attempt to give even a rough idea of all the requirements which apply to the many funds would be virtually impossible. Almost without exception, scholarships are granted according to individual merit and need. Therefore, parents seeking such aid for their children should make their own direct inquiry.

There are generalities, however, which are common to most funds. For example, again almost without exception, scholarships do not meet complete financial requirements. Recipients must expect to pay portions of the expense on their own.

Most scholarships are awarded to assist in paying expenses of tuition, matriculation, lab fees, and similar costs. Very few are earmarked for aid in offsetting living expenses. The reasoning is simple: if the students were not attending school, parents or guardians would still foot the bills for their subsistence.

The availability of financial aid directly from the institution of choice is almost as little known and used as that available exclusively from military sources.

The Department of Health, Education, and Welfare recently published a revised edition of their periodic catalog, *Financial Aid for College Students: Undergraduate*. A companion publication for graduate students is also available. More than 200 pages are devoted to a listing of 1,562 colleges and universities throughout the United States and its territories which offer financial assistance to students. Scholarships alone number more than 235,000 totaling nearly $66 million.

In addition, the catalog outlines tuition and material fees which each college charges, plus a rough average of on-campus living costs. Available loans and employment opportunities at the school are also included.

An indication of the extent of this aid is obvious from a sampling of the material contained in the publication. Picking at random, Hope College of Holland, Mich., provides an excellent example. Tuition and required fees average $400, and board and room, $580, annually.

In return, Hope College offers a total of 205 scholarships, 87 of which are reserved for entering freshmen. The average value is $129; however, some reach as high as $1,100. Thirty loans are granted each year and these average about $400 for freshmen and $600 for upperclassmen. Well over 200 on-campus jobs are available at an average annual wage of $180, and 10 teaching and research assistant positions are filled from the student body at an average annual wage of $450. Full time enrollment at Hope College is less than 900 students.

In short, aid is available for more than 50 percent of the entire student body, and the example selected is typical of many of the college assistance programs.

Parents of children who have reached or are nearing college age should obtain a copy of the publication and write directly to the school administration for details. The catalog is available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., for $1.00.

The National Merit Scholarship Corporation is working with 24,000 secondary schools in selecting recipients for their awards.

Basis for this aid is competitive examinations and details are available through local school boards or by writing to the corporation at 1580 Sherman Ave., Evanston, Ill.

The Federal program is still in the legislative stage, but if adopted in its present form would provide 25,000 scholarships of $1,000 each for four years.

The lode has been opened. The mining problem is yours.

Editor's Note: *The following report, condensed from the original which appeared in the Lincoln AFB* Jet Scoop *shows how casual information can be used by espionage agents to compile intelligence data. This article is based on a true security vulnerability test typical of the type conducted by the Inspector General's office of the Strategic Air Command.*

# YOU TOLD THE ENEMY THIS:

The following report is submitted pursuant to orders received from your headquarters dated 15 December 1957:

I. Team Y-1717 initiated espionage operations against (blank) Air Force Base on 16 December 1957. Headquarters were set up in the Wheat-thresher Hotel. Saturation espionage operations were employed. All information was forwarded to your headquarters via radio.

II. Agent Shirley Smith (Ludmila Sholokhov), posing as a home economics expert conducted a series of house-to-house morning calls introducing herself as a representative of "Mountain Silver Dairies, Inc." Under the pretense of surveying home use of dairy products she obtained the following information:

(a) Movement of the (blank) squadron was expected during January. This was revealed by dependent personnel as a reason for cutting milk and butter orders.

(b) Many dependents made statements indicating the (blank) squadron was bound for an Arctic or sub-arctic area. *("He won't be needing frozen orange juice where he's going. Everything up there is frozen.")*

III. Agent Sidney Porter (Igor Novikova), posing as a reporter, visited residences of military personnel ostensibly to prepare an article entitled "The USAF Wife." His report:

(a) The (blank) squadron was scheduled to deploy on 15 January 1958 to an Arctic area. *("We're thankful it isn't a PCS move. We were up there once and the children's present snowsuits wouldn't be warm enough.")*

(b) The deployment would be only for a 45-day period. *("We were there for two years and he's glad it's only for six weeks this time.")*

(c) The unit will deploy using its own aircraft. *("Jim has been working night and day for two weeks altering the airplanes so they can carry passengers.")*

IV. Agents Joan Johnson (Elena Kurochkin) and Jean Smith (Irina Ilyanski) concentrated on airmen frequenting the Wing-Ding Bar.

(a) The (blank) squadron is being deployed to support a tactical operation. *("If it wasn't for us, the (blank) would be out of luck. They might get the credit, but we do the work.")*

(b) The period of deployment would be for 45 days. *("Beer, miss? I won't be buying a girl a drink for the next six weeks.")*

(c) It is presumed that the forward base of deployment would be (blank). Statements indicated that no refueling stops would be made during the flight, thus placing the destination within a radius of (blank) miles. *("We'll be cooped up in that plane for 10 hours before we get there with no stops along the way.")*

V. Agents Roger Jones (Vladimir Povelkin) and Roy Arnold (Yuri Zimina), dressed as workmen, entered the installation stating they were employed by the Consolidated Power and Light Company. Restricted Area Badges were obtained at the base exchange from jackets hanging on the clothes racks. They successfully obtained the countersign for access to the aircraft area by convincing an airman that they were making a survey for the installation of power outlets. The following phases were accomplished:

(a) Aircraft carrying munitions were determined. *("Boy, make sure that stuff is tied down. I don't like the idea of flying with ammunition rattling around in the rear compartment.")*

(b) Aircraft carrying personnel were determined. *("I'll bet they get tired of bucket seats this trip.")*

(c) A pile of baggage was observed unguarded waiting to be placed on aircraft. Delayed action thermite pencils were placed in duffel bags.

VI. Agent James Masters (Georgi Dunayev), posing as a telephone company linesman, entered the installation to allegedly install new telephone leads. A tap was placed on the telephone lead of the wing headquarters building. From an abandoned farmhouse located on base property, agent Doris Blye (Varvara Polyanski) montitored the phone with a tape recorder. The report follows:

(a) H-hour. *("George, this is Mike. Listen, got a problem. If your boys are going to get aboard at 0830 hours, who is going to load the baggage on 183? Buddy, it has to be loaded by 0800 at the latest and that only gives us 30 minutes leeway before we take off.")*

(b) Number of persons involved in the movement. *("I'm not interested in your excuses, friend. I want in-flight rations for (blank) men.")*

(c) ETA at forward installations. *("Joe, is the forward echelon arranging to secure the cargo when we get there? They should be standing by for the job as our people will be dog-tired after sitting in bucket seats for 10 hours. Could you arrange it? Yeh, we'll touch down at 1830 hours so you can notify them to be ready for us. O yeah, don't forget to classify the message. Can't afford security leaks. Thanks.")*

VII. This report confirms radio messages dated 18, 19, and 23 December 1957. We are glad to have contributed toward the destruction of material and personnel involved in this mission. No difficulty was encountered by any agent during this operation. This team is standing by for further instructions.

JOHN DOUGH
Y-1717

# AIRMAN'S WORLD

## THE BIG KICK →

Zero Length Launch (ZEL), a modification of the JATO principle, has been adapted for use with North American F-100D *Super Sabres*.

This unique takeoff aid was used in an experimental capacity with earlier jet fighters some years ago and then temporarily abandoned when supersonic fighters entered the inventory.

The principle is simple. A solid propellant booster is attached to the underside of the plane's aft fuselage. Utilizing this boost in addition to the thrust of its own engine, the plane is virtually rocketed into the air from a mobile launching platform. As the booster charge is exhausted, it is ejected leaving the plane in customary flying configuration.

Boosters utilized in the recent tests conducted at Edwards AFB, Calif., carried a 130,000-pound thrust kick, and the aircraft was able to accelerate to 275 m.p.h. in less than four seconds.

Use of the ZEL system, developed by Astrodyne, Inc., provides the F-100 with a new versatility, allowing wide dispersal of the aircraft to isolated areas where any small, inconspicuous plot of land could become a takeoff base for the heavily armed fighter which boasts H-bomb carrying capabilities.

Pilots of aircraft launched via this method would perform their normal combat strike and be free to utilize any friendly airstrip at the completion of their mission.

Gen. O. P. Weyland, commander of USAF's Tactical Air Command, was high in his praise of the test results. "The ZEL system materially improves the quick reaction time of the already versatile tactical fighter," he said. "Individual aircraft can be concealed or camouflaged relatively easily, and numbers of aircraft can be dispersed so that no more than one could be damaged or destroyed by a single missile or bomb even if located," he added.

Production models of the aircraft, now being manufactured, are modified to permit use of the launch principle.

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## CHANGES

Extensive command changes became effective July 1 involving both Military Air Transport Service (MATS) and Strategic Air Command (SAC).

Principal among these was a command jurisdiction switch from SAC to MATS of Travis AFB, Calif. Coincident with the assumption of base responsibility, MATS officials announced formation of the new Western Transport Air Force, a coalition of the Continental and Pacific Divisions. They will be headquartered at the California station.

Also effective July 1 was the redesignation of Atlantic Division at McGuire AFB, N. J., to Eastern Transport Air Force.

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## SMALL PACKAGE

A small package with a king-sized message is an apt description of a new 21-page booklet published by Department of Defense and programmed for free distribution throughout the USAF.

Titled *The United States Air Force*, the concise text is supplemented by several dozen photos and provides a neat, compact sketch of the Air Force.

The overall picture depicts USAF as the primary air arm of the land-sea-air military team. It shows where the Air Force has been, where it stands at present, and where it is headed as the speed, range, and altitude capabilities of its vehicles move it into space.

Proposed Department of Defense reorganization and establishment of unified commands are not expected to remove or change most responsibilities and functions of major significance which are outlined in the pamphlet.

## PAY AND PERSONNEL

"I am convinced that it is now incumbent on all commanders, and in fact on all members of the Air Force, to raise our sights and achieve the highest standards possible and maximum effectiveness in everything we do."

Gen. Thomas D. White, USAF Chief of Staff, used these words to emphasize that the new career compensation bill, which was effective on June 1, will mean more than simply a pay raise for personnel.

Retention has been one of the major personnel problems of recent years. General White has expressed the belief that the increased pay scales should help eliminate that problem. In its place, USAF's chief emphasized the increased importance of officer effectiveness reports as a basis of "promotion for the deserving and elimination from the service of those not contributing to its effectiveness."

Turning to enlisted categories, General White confirmed that adequate controls are available to assure that only the most qualified are enlisted, reenlisted, or promoted.

Personnel officials were quick to take advantage of the expressed policy. Recent messages from DCS/Personnel, Hq USAF, reemphasized the use of existing regulations to assure the elimination of personnel not pulling their share of the load.

Additionally, the E-8 promotion pro-

gram, which is presently in the selection stage for first-round September hikes, has made promotion board evaluation a mandatory part of advancement to the new "super" grades. This marks the first time that such action has been placed on a mandatory basis in the airman promotion program.

General White stressed that during the past year USAF has made significant progress in improving its effectiveness and is moving toward the goal of a highly professional force. To maintain these high standards will require the continued application of personnel quality controls.

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## THE HIGH COST OF LEARNING

Nine major changes in the USAFI program are outlined in a recent ALMAJCOM message (AFPMP-12-B 131212). Principal changes include an increase in enrollment fees from $2.00 to $5.00 and elimination of all self-teaching courses which, with the exception of spoken language and elementary courses, may be taken by the correspondence method.

Under the revised criteria, students desiring to do refresher work or prepare for USAFI tests may obtain course materials on a loan basis from local education services offices. Military personnel participating in group study classes will be required to enroll in USAFI, but fee payments will not be required.

Additionally, satisfactory completion of a group study class which utilizes USAFI materials will entitle the participant to enroll in USAFI correspondence courses without payment of enrollment fees provided he successfully completes each course in which he enrolls.

Course credit will be given only when end-of-the-course tests have been successfully completed for both correspondence and group study courses. However, passing the end-of-the-course test *without prior enrollment* in the course will not be considered sufficient qualification to allow the individual to enroll in a correspondence course without fee payment.

Current transfer procedures will remain the same except when the transfer is made from group study to correspondence courses. Then, unless previous eligibility for free enrollment has been established, the initial $5.00 enrollment fee will be assessed.

Details relative to the program changes may be obtained from local education services officers. Revision of AFR 34-23, *Use of United States Armed Forces Institute Services and Supplies*, is scheduled to follow in the near future.

## RETRAINING REVISIONS

Several minor amendments have been made in the retraining program reported in *Retraining Revision*, page 22, June 1958 issue, THE AIRMAN.

Two AFSCs, 56170 and 64173, have been deleted from the list of resource skills from which airmen are eligible to retrain.

At the same time, four courses have been dropped from the list of those available. The courses are AB 20130, Cryptanalytic Aide; AB 27231, Control Tower Operator; AB 27232, Aircraft Landing Control Operator; and AL 46131, Munitions Disposal Technician.

Simultaneously, four new courses have been added to the list. They are AB 31130H, Guidance System Mechanic (TM-61); AB 31320H, Control System Mechanic (TM-61); AB 64131, Organizational Supply Specialist; and AB 64132, Supply Records Specialist. The first two courses are available to personnel between the grades of airmen second class and staff sergeant; the latter two to airmen second and first class only.

## KICK-OFF

In spite of summer's heat, next month marks the opening of the 1958 football season. It will also be the first year in which the United States Air Force Academy can boast senior members on its grid squad.

Ben Martin, new head coach of the *Falcons*, has listed 56 names on the probable squad roster, including 19 seniors, 13 juniors, and 24 sophomores.

The 1958 schedule includes four "home" games, three at Denver and one at Colorado Springs, permanent home of the USAFA. The *Falcons* meet Colorado State University (October 11), University of Utah (October 25), and the University of Denver (November 8) in Denver. The lone game at Colorado Springs is against the University of Wyoming on November 15.

Six road dates include the University of Detroit (September 26), University of Iowa (October 4), Stanford University (October 18), Oklahoma State University (November 1), University of New Mexico (November 22), and University of Colorado (November 29).

## BLUE LIGHT

When the United States Air Force Academy begins operating from its permanent campus near Colorado Springs, Colo., next month, cadets will benefit from an electronic version of an age-old custom of military academies the world over.

The traditional flag-and-yardarm system of designating uniform requirements will quietly pass into limbo in favor of a modern designator device.

Because of floor plans in the new cadet barracks, the traditional flag display is impractical. As a result, colored light panels have been installed in strategic hall locations throughout the modern six-story building.

Each panel contains 12 lights of various colors which may be flashed singly or in combinations to designate uniform requirements for each formation.

# Lest We Forget

Within a year after becoming an autonomous part of the Nation's military establishment, the USAF was a partner in one of the largest peacetime operations in world history.

On June 16, 1948, Berlin, Germany, was suddenly shut off from the western world by a Soviet blockade which halted all surface transportation in and out of the city.

Almost immediately, USAF transport aircraft began their historic aerial bridge into the beleaguered city. Their job was to supply more than 2,000,000 people with food, fuel, and industrial necessities—a task never before attempted on such an enormous scale. Daily food requirements alone—although strictly rationed—amounted to 1,439 tons.

To further complicate the task, all aircraft had to fly in three air corridors only 20 miles wide, maintain three-minute flying intervals and an exact 170 m.p.h. while in the corridor. Repeatedly, throughout the life of the lift, the Russians chose the areas adjacent to these corridors for anti-aircraft practice or violated the corridors themselves with buzzing fighter aircraft in an attempt to slow or halt operations. Despite the many difficulties, before the lift was six months old, operations had been so successful, food rationing was actually decreased.

Within just a few days after Air Force crews inaugurated the unique airlift, they were joined by their RAF counterparts. Within weeks transports from all over the world poured into West Germany to add their tonnage to the mounting stockpiles in the quartered former capital. Before "Operation Vittles" was written into history, USAF and the RAF were joined by U. S. Navy VR squadrons and British civil transport crews.

These airmen wrote one of the brightest chapters in aerial transport history. From a meager 45 tons of supplies delivered on June 25, the Combined Allied Airlift Task Force eventually reached a one-day total of 12,849 tons on April 16, 1949.

The Army Transportation Corps supervised supply which ran the gamut from coal through foodstuffs such as yeast, flour, salt, milk, and meat, to raw materials and construction equipment. When runway repairs were needed at Tempelhof, the modern equipment proved to be too large to be loaded aboard airlift planes. An expert was flown in from the U. S., the heavy machinery was cut up by acetylene torch in the west, loaded, flown to Berlin, and reassembled there. The lift became so successful at solving problems that it eventually became possible to fly 10 tons of malt per day to Berlin's breweries.

Contributions of ground control approach operators were at least as great as those of any other group. In an average month, for example, GCA landings at Tempelhof alone were greater than those at all civil airports in the United States.

When two fields proved to be insufficient to handle the growing daily tonnage, Berliners, utilizing obsolete equipment and makeshift materials, grubbed a third field, Tegel, out of the ruins of their city in a record 92 days, and paved the runway with millions of cubic feet of crushed brick from demolished buildings.

The combined efforts of these thousands of people forced an end to the blockade in less than a year. The airlift actually operated for a period of approximately 15 months as supplies were hauled into Berlin for several weeks following resumption of surface movements.

No single day passed without trips despite long periods of some of the worst flying weather ever experienced in Europe. When operations finally halted, Berliners boasted a stockpile of necessities against a possible recurrence.

Statistics logged by CALTF are staggering. Flights into Berlin numbered 279,114; tonnage 2,324,257; total distance flown, 109,228,502 miles or the equivalent of more than 200 round-trips to the moon.

Airlift operations ceased nine years ago this month, August 1949. Shortly thereafter the grateful citizens of West Berlin erected a 90-foot monument, topped by three flying arches to symbolize the three air corridors, to the fliers. The monument stands immediately adjacent to Eagle Square at Tempelhof Air Base, one of the key strips utilized as an eastern terminus during the immense operation—a lasting tribute to men who flew and died to save 2,000,000 people from starvation and Communist domination.

## RETIRING?

Two major changes in regulations governing travel and residence in foreign countries for USAF retirees have been announced.

According to information contained in a recent newsletter for retired USAF personnel, the requirement for prior permission to travel or maintain residence in a foreign country after retirement has been waived for personnel in all categories but one. The exception concerns retired personnel who occupied "sensitive" positions or had access to "sensitive" information.

Personnel falling within this category must still obtain permission from the Director of Administrative Services during the "time limitations" established at the time of their retirement. Once that period has elapsed, permission no longer will be mandatory. However, all personnel will be required to meet State Department regulations as well as those of the country to be visited or in which residence will be maintained.

At the same time, it was announced that persons planning residence in a foreign nation, who also desire travel and household goods shipment, must request orders from the Director of Military Personnel, Hq USAF, Washington 25, D. C., ATTN: Retired Activities Branch. Correspondence should contain the following information: Name and address of retiree plus name and relationship of dependents who will accompany the applicant and ages of minor dependent children; place from which travel will begin and destination on a city-to-city basis; address to which orders should be mailed and desired port of departure; date of availability for port call; whether shipment of household goods is desired; and whether concurrent shipment of privately owned vehicle is desired. Attached to the request should be a copy of retirement orders issued by the Department of the Air Force and a statement that travel has not been previously performed to a "home of selection" at government expense.

This is one of the first released photos of the new Air Force Fairchild SM-73 Goose, a ground-launched diversionary missile. The Goose is listed in the category of "penetration aid," which means it would be launched ahead of or at the same time as other strategic missiles and manned bombardment aircraft to serve as a decoy against enemy air defense systems. The missile has undergone extensive firing tests at Cape Canaveral, Fla.

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## BITS OF BLUE

. . . Two new popular names have received official USAF sanction for purpose of equipment identification. The Fairchild SM-73 missile will henceforth be known as *Goose*, rather than *Bull Goose*, and the Douglas C-133 has been assigned the official title of *Cargomaster*.

. . . The School of Business of the Air Force Institute of Technology has been accredited by the American Association of Collegiate Schools of Business and is now authorized to award degrees. Located at Wright-Patterson AFB, Ohio, USAFIT's School of Business is currently offering engineering administration, industrial administration, and applied comptrollership at the master's degree level.

. . . Completion date for the final moving phase of the Air Force Academy from its temporary campus at Lowry AFB, Colo., to its permanent home at Colorado Springs has been established as September 2. The Academy Superintendent has been given the authority to direct the overall movement.

When the academic year begins on September 2, the Air Force Cadet Wing will include four classes for the first time since the Academy was established in 1955.

## SOUP TO NUTS

Officials at Forbes AFB, Kans., are more than satisfied with the results of a two-week indoctrination school for new arrivals at this Strategic Air Command station.

Basic mission of the novel school is to foster a better understanding not only of the role of SAC and Forbes, but also of Kansas and the surrounding community.

Upon arrival at the gate, the new assignee is presented with an informational brochure on the base and community and directed to base indoctrination headquarters. There he is enrolled in the school and launched on an action-packed schedule which includes a complete military briefing and tours of the base, Topeka—the adjoining city—and the Kansas State Capitol. The latter is highlighted by attendance at a session of the state legislature and a personal meeting with the governor, the Honorable George Docking.

At graduation, airmen are assigned to their respective duty sections, better informed and aware of the policies and aspects of both the base and the surrounding community.

Reports indicate that the new program has not only sharply reduced incidents, both on base and in town, but has also resulted in increased job efficiency and improved base-community relations and understanding.

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## AERO CLUBS

Aero clubs have long operated under official Air Force sanction, but USAF headquarters recently saw fit to remind commanders that this sanction did not include the assignment of military or civilian personnel for maintenance, instructional, or general administrative duties within the program.

AFR 34-14, the governing regulation, specifies that clubs must operate on a self-sustaining basis. Bearing this in mind the content of an ALMAJCOM message concedes that though the responsibility for adequate supervision and control of the clubs may require limited utilization of personnel to perform command functions, the assignment of military and civilian personnel, paid from appropriated funds, is not authorized.

## CONCURRENT TRAVEL

New advance application procedures for concurrent travel to Ramey AFB, Puerto Rico, for master sergeants and their dependents became effective July 1 according to information contained in ALMAJCOM message AFPMP-2F 131230.

The same message stated that all airmen below the grade of master sergeant are required to wait until arrival at Ramey before requesting dependent travel orders. Movement for these personnel will be governed by a priority list.

Applications for concurrent travel should be submitted in accordance with Chapter 5, Part 10, AFM 75-1. Details contained in the cited message may be obtained from local personnel officers.

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## SONIC RING

Members of the class of '59, United States Air Force Academy, received their class rings in June, a year prior to graduation. The occasion was marked by the presentation of symbols as "hot" as USAF officials believe the cadets will be upon graduation.

The sonic symbol was born when Col. Benjamin Cassiday, Jr., Deputy Commandant of Cadets, flew the first class rings past the speed of sound in a North American F-86 *Sabrejet*. The Lowry AFB, Colo., bombing range was used for the supersonic pass. The implication derived from the unique ceremony was that the first Academy class will be entering a supersonic Air Force.

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## CORRECTION ON CAP

In the May issue of THE AIRMAN (Airman's World, *First Step — Four Stripes*, page 38) some qualifying factors of the CAP program for WAF officer candidates were omitted.

Officials at Civil Air Patrol headquarters have supplied the following clarifying information on eligibility requirements.

Under program provisions, selected female cadets and senior members who are high school graduates and who hold Certificates of Proficiency, may now be accepted as WAF officer candidates. Upon acceptance, they will be appointed to the grade of staff sergeant which they will then retain throughout their six-month training program. Upon successful completion of the officer candidate course, they will receive commissions as second lieutenants in the USAF Reserve.

# HOW SERVICE LEGISLATION IS BORN

by T/Sgt. Harold L. Craven
*Airman Staff*

HUNDREDS of laws enacted by Congress govern the activities of the Air Force and its sister services. Additional laws are enacted each year for the purpose of maintaining the Nation's military strength. Much of this legislation—the recent military pay bill is an example—directly affects the living standards and well-being of Air Force members and their families.

Legislative ideas spring from many sources. You can be the father of an Act of Congress. Some of our laws are drafted by members of Congress and others originate from the right to petition, guaranteed all citizens by the First Amendment to the Constitution. Executive communications, in the form of letters from the President, members of his cabinet, or heads of independent government agencies, are the basis for many laws enacted—or rejected—by our elected representatives.

Air Force legislation can originate in the field or within the Air Staff. An idea dropped into a suggestion box at your base, if it is good enough, can be the basis for new legislation.

Let's assume that you have a plan that you believe is an ideal solution to the problem of encouraging first-term enlisted technicians to become career airmen. It provides incentives for reenlistment that have never before been proposed in any military service. You believe these incentives would more than double the current reenlistment rate and this, in turn, should reduce the need for new enlistees, number of technical instructors required, and the amount of on-the-job training necessary in basic technical skills. What's more, you are convinced that adoption of your idea will permit the Air Force to be more selective than ever before in its recruiting, perhaps even to the extent that all future original enlistments could be put on a competitive basis.

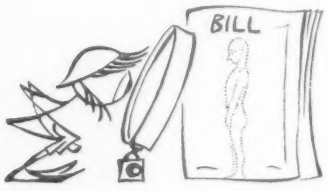
You put your idea in writing, label it "A Program for Retention of Enlisted Technicians," and drop it into the suggestion box near your place of duty. You know that

there is a long road between the suggestion box and the President's desk, but you are convinced that your idea is capable of making the entire trip.

Two days later, at its regular meeting, the base suggestion committee analyzes your suggested program and decides that it is good. The chairman of the committee submits it to the base commander with the recommendation that it be given further consideration.

The base commander can accept or reject the recommendation. He orders a staff study before making his decision. The staff officers analyze your suggestions and each of them recommends approval. The personnel officer comments that the provisions of your program should be extended to include junior officers as well as enlisted personnel. The base commander accepts the results of the staff study and forwards it, with your proposals, through channels to the appropriate deputy chief of staff at headquarters, USAF. Enroute to USAF additional comments, all favorable, are made by commanders at intermediate echelons. Additional staff studies could have been conducted along the way, but because your original plan was so well presented, and because staff work at base level had been thorough, no additional staff work was ordered.

The appropriate deputy chief of staff for your proposals, since they involve personnel, would be the Deputy Chief of Staff, Personnel. He receives the entire file including the staff study and the comments of commanders at the various echelons




through which it has passed. The file of information gives a rather complete view of how your suggestion would affect your command. His decision, however, must be based on the effect it would have on the entire Air Force. At this point he can reject the program, accept it as presented, or incorporate changes into it based on his own overall knowledge of the personnel situation. He can discard some of your suggestions and have action started to put the remainder of them into effect. Since your program is good, has received favorable endorsements all along the line, and appears to be applicable to all Air Force personnel, regardless of command, it is accepted in its entirety. But several suggestions made by a particularly brilliant young staff officer at your base have been added.

Because your program, as amended, still involves military personnel only, the Director of Military Personnel is assigned the job of putting it into effect. His department becomes the action agency.

The action agency farms the proposed program out to all other interested staff directorates for coordination. These directorates can register approval or disapproval or suggest amendments. The Judge Advocate General's staff, during this coordination, conducts research to determine if there is existing authority within the Air Force for putting your proposals, and amendments thereto, into effect.

Your plan is approved in all the staff directorates, but the Judge Advocate determines that it can not be adopted without new legislation.

Following staff coordination the action agency presents the package to the Vice Chief of Staff, requesting approval for further action. He studies the proposals and accompanying documents, then sends the material to the Office of Legislative Liaison with a request that the necessary legislation be prepared and included in the Air Force legislative program.

The Office of Legislative Liaison drafts a proposed *Speaker Letter* to the Speaker of the House of Representatives. The letter includes justification for the proposed legislation, budgetary information, and a request that the legislation be approved by Congress. The Judge Advocate General's staff drafts the proposed law and copies of the two documents are sent to the Army and Navy for coordination. In the event these services want to get in on the legislation, register objections to it, or amend it to fit their needs, they may do so.

Personnel retention problems occur

in all the services, and your suggestions on how to solve those problems appeal to the Army and Navy as well as the Air Force. They write themselves into the proposed law and return it to the Air Force.

Air Force sends it to the Office of the Secretary of Defense for approval or disapproval. Since the services have agreed and it appears to be good legislation, a decision is made to continue action.

The Bureau of the Budget gets the legislation and conferences are held to determine if it is justified. It clears without difficulty and is returned for further action.

A new *Speaker Letter* and a new draft of the proposed law are prepared and sent to the Speaker of the House of Representatives. An identical letter and draft are sent to the President of the Senate. The bill is introduced on the floor of the House of Representatives and it is given an HR (House of Representatives) number. It is referred to one of the committees, in this case the House Armed Services Committee, and the Armed Services Committee, in turn, refers it to a subcommittee.

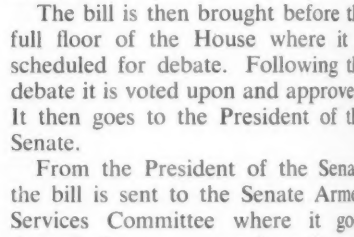
The subcommittee schedules the bill for hearings. Representatives of the three services testify giving their views. Following this testimony the subcommittee decides in executive session whether to accept the bill, reject it, change it, or write its own bill.

In this case anouncement is made that the subcommittee has approved the bill. It is then reported to the full House Armed Services Committee where its merits are discussed. It can be killed in this session; it can be changed and reported to the full floor of the House; or it can be reported to the full floor of the House in its present form.

Minor changes are introduced, not in the substance of the legislation but in the timing. The bill has proposed that its provisions be made effective immediately upon enactment. The committee, taking into consideration certain testimony introduced in the subcommittee hearings, has decided that it should become effective at the begining of the third month following enactment.

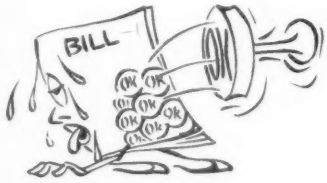
The bill is then brought before the full floor of the House where it is scheduled for debate. Following the debate it is voted upon and approved. It then goes to the President of the Senate.

From the President of the Senate the bill is sent to the Senate Armed Services Committee where it goes through the same procedures it went




through in the House. Again the only part of the bill questioned is the effective date. The Senate Armed Services Committee, following a brief discussion, decides that the timing change inserted by the House Armed Services Committee should be rewritten. The revision is made and the bill is passed by voice vote.

Because the two houses of Congress have passed bills which differ from one another, there must be a joint conference of both houses. A compromise bill is agreed upon, establishing the effective date of the bill's provisions as "not later than the




first day of the second calendar month following enactment." The compromise bill then goes back to the full floor of the House to be voted upon. The House can approve it or disapprove it. If they disapprove it, it is dead. It is approved and sent to the Senate. The Senate also has life-or-death power over the bill. It is approved by the Senate and sent to the President.

But it is not yet law.

The President sends the bill to the Bureau of the Budget. It then goes to the Department of Defense which sends copies simultaneously to the three services. The services have 24 hours in which to prepare recommendations that the President sign the bill into law or veto it. Because the compromise bill meets the needs of the services, they recommend that it be signed into law. These recommendations are returned to the Office of the Secretary of Defense which returns them to the Bureau of the Budget. Bureau of the Budget consolidates the recommendations of the military agencies, plus recommendations of any other interested government agencies which might be affected by the bill, and makes a final recommendation to the President. The recommendation, in this instance, is that the bill be signed into law.

This recommendation is not binding upon the President. He has three alternatives.

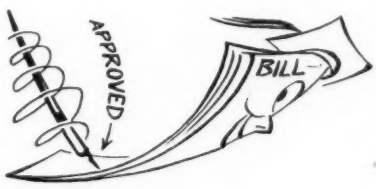
He can return the bill to Congress with his objections. This is a veto. Congress can override the veto by a two-thirds vote, and in this event the bill would become law without the President's signature.

The President can allow the bill to become law without his signature by allowing 10 days (excluding Sundays and holidays) to elapse after it has been presented to him. If, however, Congress should adjourn before 10 days have elapsed, and the President has not yet taken action on the bill, this is a pocket veto, and the bill is dead.

In this instance, however, the President follows the recommendation of the Bureau of the Budget. He signs the bill promptly and your program has become law.

The legislative mill through which your suggestions were processed is, under ordinary circumstances, a slow-moving machine. Some critics of our lawmaking system claim that it is outmoded—that it is not equipped to meet the needs of the Nation in times of crisis.

However, standby legislation, fully processed up to the point of trans-




mittal to Congress, is kept up to date within the Executive department. In the event of a national emergency it would be transmitted to Congress within minutes of a decision by the President. Executive orders and departmental regulations based on this standby legislation have already been written and would be put into effect immediately upon enactment of emergency laws.

When there is no emergency it is to our advantage that the legislative processes be slow and thorough. There are many steps between a law's conception and its birth, and these steps permit a thorough study of its provisions from many viewpoints. The result of the open, free discussions provided for under our Constitution is frequently the improving of a bill before it becomes law, or the defeat of a bad proposal. The Federal lawmaking process, which gives all citizens an opportunity to make their views known, is a major safeguard of American freedom.

## Shooting the Breeze

A couple of THE AIRMAN's staff members recently returned from a brief trip to USAFE. In addition to a wealth of feature material, they brought back two of those "you'll-never-believe-this" type items.

### Methuselah

First there's the bit about USAF's oldest airman. The gentleman qualifying for the title is M/Sgt. Robert Wade, Bitburg AB, Germany.

His recent marriage license application raised eyebrows to a new high when he presented his birth certificate as a supporting document. German authorities issued the license despite the fact that Wade's birthdate was listed as the year 198. Because of an error in Clay County, Mo., birth records, he can legally claim to be 1,760 years old, but he more closely resembles a youthful 40.

### Count 'Em

Second oddity note should probably be classed as a full volume. It concerns the mails.

A/2C Cletus Bartley, Ramstein-Landstuhl AB, spends a healthy portion of his off-duty hours simply keeping abreast of his correspondence. Bartley boasts 18 brothers and sisters—ranging in age from 1 to 50 years—and uses an average of 20 books of air mail stamps monthly keeping current with the family news.

Reunions? Oh, yes, they have those too—not in the local homestead, however. Last report had 83 of the Bartley clan utilizing a city park for the most recent hoe-down.

### GI

Last year an Air Force master sergeant was sent to McMurdo Sound for three-months TDY. Upon his return he filed his travel and per diem voucher and duly received a United States Treasurer's check for 38 cents. When questioned by his chief about the small sum, he replied, "I guess it is because they furnished the ice . . . free."

*If you know of any interesting anecdotes about USAF life, send them to us. The success of this column depends on you.*

# IT'S A GRAND OLD NAME

*(Conclusion)*

**For the first time, the untold story: How a civilian's unusual decision put U. S. airmen deeper into the zone of space flight equivalence than anyone was to reach for 22 years.**

**by William A. Kinney**

*(July Synopsis:* Our first reconnaissance sorties beyond the threshold of partial space flight were made by the balloons, *Explorer I* and *II*, in the National Geographic Society-U. S. Army Air Corps Stratoflight Expeditions a quarter of a century ago. These two missions from the Stratobowl in the Black Hills near Rapid City, S. Dak., gained rich scientific data whose value has grown with the passage of time. The first flight in 1934 took an aircrew of three to the altitude of 11.5 miles before a big rip in the envelope forced an emergency descent which ended when the big bag of hydrogen gas exploded. The crew 'chuted to safety but the gondola crashed, shattering instruments with the loss of much scientific data. Thoughtless souvenir hunters made off with other records. Despite their near brush with death, the airmen were eager to try again. A second Stratoflight expedition was set up for 1935. The epic story of these missions has been reconstructed thanks, in large part, to the cooperation and assistance of Dr. Lyman J. Briggs, Director of the Scientific Advisory Committee for the Stratoflights and now Director Emeritus of the National Bureau of Standards. The author had the benefit of this eminent scientist's vivid reminiscences together with official reports, studies, and other material.)

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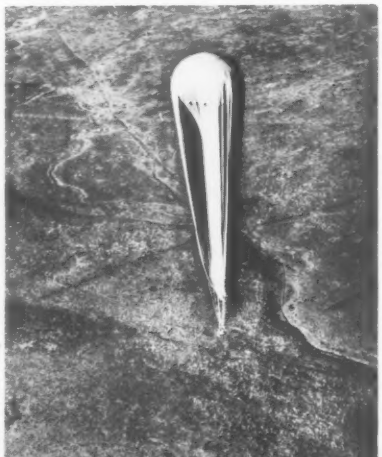
STORIED Lloyd's of London, the group of underwriters so celebrated for the insurance risks they've been taking since 1688, plus the canny judgment of a practical man to take a precaution never considered necessary before combined to make *Explorer II* a success.

Lloyd's, and a civilian's decision. An unlikely groundling combination for wresting for science secrets hidden along the high frontier of space?

On the contrary. But for the vital roles of these factors, the big mission might never have materialized nor its astounding payoff which was to evoke from General "Hap" Arnold superlative praise for the invaluable dividends it yielded the USAAF in WW II and afterwards to the USAF for subsequent development and planning, even to preparations for the coming of manned space flight.



ONLY 30 FEET TO GO. *Explorer II* eases toward a perfect "egg shell" landing after soaring to an altitude of 13.71 miles. Gondola's elongated shadow (right) indicates its proximity to the surface. Beneath the gondola grass and weeds are magnified by midafternoon shadows.

©National Geographic Society

I had heard the story of the 1935 Stratoflight related many times and, until a few weeks ago, I thought I knew it all by heart. Then I stumbled onto the behind-the-scenes train of events which called the turn for the whole show.

Talking over this second mission with Dr. Lyman J. Briggs, the courage of its financing suddenly occurred to me.

On the 1934 flight the outlay was approximately $60,000, largely defrayed by the expedition's sponsor, the National Geographic Society. Most of this was for the *Explorer I* and its equipment and did not cover the salaries and expenses of civilians contributing to the project nor military personnel assigned to Stratobowl duty. If 60 Gs sounds like peanuts for research today, it was a big bundle back in those times, with the Great Depression still on.

With this in mind I said to Dr. Briggs, "There were no pieces to pick up after *Explorer I* crashed in '34. You had to start from scratch. How did you manage to raise all the money you needed with things so tight? Wasn't it a tough job?"

His eyes lighted up. "Kinney, that's a good question. Strange no one has ever raised it with me before.

"It was all due to Tom McKnew. We have him to thank for everything. If it hadn't been for his good sense and foresight, well," he gave one of those all-off gestures.

The man he named was a member of the National Geographic's staff who served as project officer for both Stratoflights, handling all administrative and financial matters.

"What saved the day for us was his good judgment in insuring the 1934 Stratoflight with Lloyd's of London. Lloyd's accepted insurance liability for 75 percent of the project's cost. And he may have had good luck in getting them to underwrite the policy for I rather suspect that on second thought Lloyd's had misgivings about the commitment. Insurance money gave us our nest egg for *Explorer II*. Quite a bit more was needed, but we had that lump of cash in hand to get started."

He fell silent briefly, then: "If it hadn't been for Tom McKnew and the insurance money, I am quite sure we would never have been able to

stage the second Stratoflight in 1935. And if we hadn't managed it that year—well, the chances are a second expedition might very well not have come off at all. You ought to talk to Tom about this for details."

### Hedge on Hazards

At the first opportunity I saw Dr. McKnew, now Senior Vice President and Secretary of the National Geographic Society.

The amount of the insurance secured from Lloyd's, he informed me, was $34,375, with the coverage as follows: balloon envelope and rigging $24,875; scientific instruments $7,500; and the gondola $2,000. The premium, 10 percent.

He confirmed my surmise that this was the first Geographic-sponsored expedition to be protected by insurance and I asked what prompted him as project officer to take out a policy.

"In my opinion, the 1934 Stratoflight involved the possibility of unique hazards. Moreover," he added, "it involved the most expensive initial investment the Society had yet to make in any scientific project, so to my mind it was the only sensible safe thing to do."

This, as I knew, was the 38th expedition under the aegis of the Society. Quite a few of the previous ones had taken men to extremely dangerous and difficult parts of the globe, including the two of Adm. Richard E. Byrd to the Antarctic and four others to the Arctic, among them the successful expedition of Comdr. Robert E. Peary, the first to reach the North Pole. Personally, I found it difficult to believe that the *Explorer I* flight, at least during the planning stage when it was insured, should have been regarded as uniquely hazardous. The potential element of peril existed, of course, but it seemed to me a question of difference rather than degree, particularly when compared with ventures like the ill-starred Wellman's expedition of 1906-07 to the North Pole, utilizing a primitive dirigible which crashed.

The initial Stratoflight marked Dr. McKnew's first service as a project officer for the Geographic since joining its staff in 1931. All his prior work and experience had been in the field of engineering where normally it is SOP to insure construction projects, especially when unpredictable or difficult factors are involved. This background exerted a big influence on the decision about the insurance.

"You will understand," said Dr. McKnew, "that even with the insurance money in hand we had less than an adequate nest egg with which to go ahead on the *Explorer II* plans. There was for a while a grave question whether the Society should make a firm commitment in view of the economic situation. Like everyone else in the depression even a nonprofit educational organization like the Geographic had suffered.

"The ultimate decision was checked to the Society's president, Dr. Gilbert Grosvenor, who had been a fervent enthusiast for the Stratoflight undertaking from its original suggestion in '33. He said it might mean tighten our belts, 'but we'll see this thing through.' "

The amounts which could be allocated for a new balloon and gondola were insufficient. But this crisis subsided quickly when the Goodyear Zeppelin Corp. and Dow Chemical Co., maker of the gondola, volunteered to handle the orders at a loss. "A very real and important contribution on their part toward fulfillment of the program," Dr. McKnew commented.

Reverting to the period when some uncertainty beset prospects for the 1935 flight, the Geographic official paid the warmest tribute to Capt. Albert W. Stevens as the moving spirit of the entire Stratoflight program and a tireless advocate of the second mission.

"The whole idea of the daring enterprise was his originally," Dr. McKnew disclosed. "He came to us first with it either late in '32 or '33 and his enthusiasm immediately infected Dr. Grosvenor, Dr. J. O. LaGorce, and other officers of the Society. It was much the same story at the old War Department, and among his backers were Secretary of War George H. Dern and Brig. Gen. Oscar Westover, Deputy Chief of the Air Corps."

After the 1934 flight had come to grief there was no flagging in Steve's ardor, the speaker went on. He pressed the case for another try with the inspired fervor of an apostle urging a holy cause.

"A man of extraordinary ability, Steve," said Dr. McKnew. "While he was a topflight airman, I rate him higher for his scientist's mind."

I asked Dr. McKnew what happened about insurance for the second flight. He replied that Lloyd's were willing to underwrite it—but at triple

SERPENTINE ARTERIES POUR LIFT INTO BAG. With a deep-throated roar, helium rushes from 40 steel gas cylinders simultaneously through the cloth sleeves (foreground) into the balloon's envelope as the bubble of fabric begins to blossom from the ground. In all, 1658 cylinders were emptied to give *Explorer II* the 250,000 cubic feet of helium needed for ascent. When heated by the sun at peak altitudes, the gas expanded to swell the size of the balloon to 3,700,000 cubic feet, and its diameter to 192 feet.

©National Geographic Society

the 1934 premium. That was too much for the project's exchequer. *Explorer II* would have to take its chances *sans* insurance.

### Science Program Enlarged

When I resumed my huddle with Dr. Briggs in a few days I learned that despite the penny watching necessity a considerable expansion of the scientific research program had been mapped for the 1935 try.

"The balloon had a volume of 3,700,000 feet, as against the 3,000,000 capacity of the one in '34. The larger size was due to the fact that instead of hydrogen gas, which caused the explosion near the end of the first flight, we changed to helium which has somewhat less lifting power but is not explosive or flammable.

"The gondola had a diameter of nine feet, an increase of eight inches over its predecessor. Again it was built of a light weight magnesium alloy. Fully loaded for takeoff it weighed 2¼ tons, exclusive of lead ballast carried.

An amusing sidelight on the preparatory program gave him a chuckle. "There was a pressure chamber at Dayton we utilized both years to get the men ready. It probably would be called a conditioning simulator today. Anyhow we had Steve in there one day when we were running an experiment to determine whether half an atmosphere would be suitable working pressure in the gondola.

"At a point where by the book he should be experiencing some untoward effects, we asked him over the intercom how he was feeling.

" 'I feel perfectly normal,' he shot back with a shade of annoyance at any insinuation he should be feeling otherwise.

" 'Are you sure, Steve?'

" 'Look, I'll show you.'

"With that he jumped up and started to jig vigorously. He danced very few steps, however, before he tumbled over, out like a light. The atmosphere under the pressure then prevailing in the test chamber was not conducive to any vigorous exertion. We had a good laugh at Steve and he also thought it good fun."

The crew consisted of Steve and Capt. Orvil A. Anderson, a '34 veteran assigned to pilot the balloon. Steve was the mission's commanding officer, the responsibility held the previous year by Maj. William E. Kepner when three made the flight. Early in May the Stratobowl camp was reestablished but favorable conditions for the mission failed to materialize.

"The expression hadn't been coined but with the advent of July we were literally sweating out the weather," Dr. Briggs smiled, "for the month brought a wilting heat wave. Finally on the 11th our long frustrated forecasters reported the development of the high pressure system we needed. At sundown inflation of *Explorer II* started.

"Enthusiasm ran high. When word reached the camp that the aviatrix Laura Ingalls had just set a new transcontinental record for women some thought it a good omen."

That record was 18 hours, 22 minutes from New York's Floyd Bennet to Burbank, Calif. I found it later when I checked the back files of the *Washington Post*. It was front page news, along with a story headlined: "2 Airmen Set To Climb 14 Miles Into Stratosphere."

Before most readers saw that front page the morning of the 12th that bright hope had been shattered.

0300 Mountain Time. Inflation has been proceeding smoothly all night. About 125,000 cubic feet of helium —one-third of the launch volume— has been fed into the mammoth envelope. A watcher on the bowl's rim spotted through his telescope a bulge forming atop the swelling balloon.

Seconds later, with a resounding roar of escaping gas, *Explorer II* blew its top, dumping three tons of fabric to the ground and trapping three men beneath. Fortunately a steel guard rail at the gondola dome held most of the weight and cavalrymen, quick to the rescue, freed the uninjured men.

Wild reports flew. A sniper's bullet was responsible. No, it was that mysterious blue haze which suddenly wrapped the balloon at the fatal moment. It was neither. The haze was nothing more dangerous than an abrupt diffusion of talcum dusted inside the fabric to prevent sticking when the bag was packed for shipping. But the envelope lay crumpled across its launch site, a gigantic, misshapen splotch of cloth — two and two-thirds acres of it—far from the taunting stars.

**DRY RUN.** In practice that made perfect actual flight performance, Captain Stevens (right) checks radio equipment which enabled the mission's progress reports to be heard by shortwave stations around much of the globe. The coil Captain Anderson is looking at extends from a large metal flask containing a mixutre of liquid oxygen and nitrogen, used in the packaged atmosphere system which kept the air breathable.

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As McKnew contemplated the scene ruefully an Associated Press correspondent inquired whether this meant curtains.

If this was to prove the case, answered the project officer somberly, then the Geographic Society stood to be a heavy loser, he estimated, to the extent of $175,000 and $200,000. [This meant both flights—Ed.]

Scanning the newspaper editions which played the stories of the balloon's collapse I was repeatedly reminded what a big sum that represented. The ads wouldn't let anyone ignore that. De Luxe new model gas ranges, $49.95. Tropical two-pants suits, $13.85. Women's summer dresses, $3.95. "Expensive" evening shoes, $8.75 a pair. Milk, a nickel a pint. Butter, 30¢ a pound. Fifteen-year-old bourbon, $1.89 a quart.

End of venture? Even before it was known whether the balloon was salvageable, Dr. Briggs bespoke the dogged spirit and hope which was the common bond of all linked to the

project. He told the press: "We are not licked yet."

And they weren't. General Westover wrote off the setback to limited experience with the construction of balloons so large, and predicted that full investigation of the failure could only benefit "future preparations for exploration of the stratosphere." Secretary Dern's support never wavered. As for Steve and Andy, acceptance of defeat was akin to foulest treason.

The envelope was repacked and shipped to its manufacturer, the Goodyear Zeppelin Corp. in Akron for examination. Back to Wright Field went the gondola. The brooding silence of Dakota's Black Hills reasserted itself in the Stratobowl as all project personnel dispersed.

A postmortem on the envelope soon established there had been a fabric failure in the rip panel, normally used for the quick release of the gas remaining before landing. This led to the decision to abandon the standard type rip panel and substitute an arrangement consisting of a thin steel cable anchored in two metal eyes in the envelope's top. When pulled, it would literally tear wide the dome's fabric in contrast to the old method of opening one special panel.

### Hurry Up and Wait

As the popular song may well have put it, "It's a Long, Long Time From May to September." The Maytime optimism which rode high became freighted with suspense, even something near anxiety as one hot summer week slowly melted into the next while work proceeded on the balloon in Akron.

"We began rendezvousing at the Stratobowl the first week of September," Dr. Briggs resumed, "but after initial work we became reconciled that we could not be ready to get the second *Explorer* off any earlier than the first of October.

"All was in readiness by then but instead of the usual fine Indian Summer the month brought with it an ordeal of vile weather—bitter winds, storms, and snow." His eyes twinkled. "One's zest for camp life, even in heated tents, loses its edge in zero weather."

Not until November 10 were the meteorologists to report the approach of an extremely favorable weather system and the work of inflating and rigging the second *Explorer* began with the mercury hovering about 11 degrees.

"We think we have every obstacle licked this time," Stevens confidently told newsmen.

As if to spite him, the jinx struck again. Nightfall pulled the temperature down to zero, the balloon fabric stiffened with cold, making it difficult to keep spreading it to the desired positions as the inflation progressed. The heavy folds of frozen cloth blocked the normal flow of gas upward, with the result that a pocket the size of a Volkswagen was being subjected to virtually the full measure of helium roaring through the inflation hose.

"A FOREIGN AND LIFELESS WORLD." This is the look of the land from near peak altitude, "a vast expanse of brown, apparently flat, stretching on and on," in Steve's words. "No sign of life . . . could be detected."
*Air Corps Photo*

A Goodyear employee spotted a bulging pocket and shouted orders to cut off the gas. It was too late. Almost simultaneously there was a soft pop of rupturing fabric.

The deceptive softness of the sound encouraged the belief that only a small rip of a couple of feet had occurred. When it was finally located in the mass of fabric, however, it proved to be almost *six yards* in length!

"This was a most critical moment," Dr. Briggs commented. "Steve and Andy talked things over. They refused to be denied and decided to take their chances on repairing the rip. A tent of balloon cloth was improvised over the tear. A 1,500 watt bulb and reflector was put under it to heat the air within and also the patching material. A group of NCOs from Scott Field and some Goodyear people worked with the officers."

Patching the long rip consumed two hours. Its location was bad, for the patch would have to bear its share of the great weight of the fabric below. The repair work had been done under the most unfavorable conditions, but the two flyers were eager to risk their lives on its holding. Much precious time had been lost. The scheduled takeoff hour, 0530, slipped past. Skies brightened. Flags along the rim of the bowl showed a freshening in the dangerous southwest surface wind.

Shortly before 0700 the ground crew "walked" *Explorer II* as far as possible to the side of the bowl opposite the rim winds. The flyers aim was to "shoot" the balloon up with such a speed it would not drift sideways against the tree-spiked sides along the rim.

Poised atop the gondola Anderson signalled the ground crew to release the ropes. 0701 hours: the *Explorer* was free at last to make its long denied bid.

### Up to 13.71 Miles

"It was a beautiful exhibition of airmanship," said Dr. Briggs. "The takeoff was faster than a racing balloon's and we knew at once they would clear the rim safely with ease.

"But a sickening moment was upon us almost immediately. The gondola had reached an altitude of about 100 feet above the rim when unaccountably the balloon ceased climbing and began settling fast and sweeping menacingly down toward the heads of the thousands of spectators thronged around the rim area to witness the start of the flight.

"As Steve and Andy agreed later the balloon had struck a strong downdraft the minute after clearing the rim. They certainly gave a superb demonstration of lightening teamwork in the emergency, dropping 750 pounds of ballast in three seconds!"

The draft had pulled the *Explorer* down a scant 50 feet above the ground, and less above the tall trees in the vicinity. The spectators scattered frantically, while the discharged ballast in the form of lead shot sprayed down on their heads like rain.

With the dumping of the ballast, the emergency passed and the ascent resumed. At 0730 an altitude of 16,500 feet was reached and held while the hatches were sealed and the air repurifying apparatus turned on. With the dropping of more ballast at 0840 the climb continued. By 1030 the flyers were at 63,000 feet and twenty minutes later they had arrived at the "top"—72,395 feet—the highest mortal men had ever been or would be again for 22 years.

Radio reports from the *Explorer II* were somewhat less frequent than from the 1934 Stratoflight due to the fact there was one man less in the crew. Andy and Steve were kept extremely busy most of the time with their duties; monitoring instruments and making observations. However, radio contact was established often enough to follow the flight's progress.

Radio reception and transmission throughout the flight were uniformly excellent. Short wave reports from the gondola were heard throughout the Western Hemisphere and in Europe generally. During the hour and 40 minutes spent at peak altitude, the airmen talked to Secretary Dern and Dr. Grosvenor, President of the Geographic, in Washington, and to a newspaper correspondent in London. Contact also was established with a Pan American Clipper flying over the Pacific.

Dr. Briggs remembered one transmission to reach the Stratoflight by mistake. An eastern radio announcer was issuing instructions to his colleagues on the network on the handling of a rebroadcast.

"Don't play up this record business, boys, until we are sure they have gotten down safely. There is still plenty of chance for them to crash and they have to come down alive to make it a record."

That intercept tickled Steve's sense of humor no end.

### Water Hot, Food Frozen

In their personal inventories on the progress of the flight, both men remarked later that there had been a minimum of talk between them, because of preoccupation with their work.

The only conversation of any length evidently occurred at 65,000 feet when the bottom appendix of the balloon opened for the first time and the airman looking through the gondola's top porthole could see the inner side of the mammoth bag's dome which seemed so very far above them. The opening of the appendix was a sign they had reached "pressure height"—the altitude at which the balloon's gas, after expanding steadily during the ascent due to the sun's heat, finally filled the big envelope completely and was beginning to overflow in an escape through the appendix bottom serving that purpose.

ALL AMERICAN, NATCH! In a schoolboy's lend-lease helmet, Captain Anderson wears a contented "mission accomplished" expression as he walks away from the gondola after the happy landing near White Lake, S. D. Andy's substitute "brain bucket" was provided by the high school grid squad in the community near launch site. Numerous observers crowding toward gondola indicate how quickly crowd swelled seconds after touch-down. Captain Stevens (left) has his back to the camera, standing near the man with the black, brim-down hat.

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As in the 1934 Stratoflight, the packaged atmosphere system kept the atmosphere breathable and neither man noticed any difference between it and regular air. Again, too, the verdict was the gondola, although small and crammed with instruments, "was really pleasant to be in."

The dead silence of the realm through which the second *Explorer* was drifting at a considerable speed did not, on the other hand, have an adverse psychological effect on the men. Steve wrote that his feeling was that of "being in a profound calm," with the illusion the gondola was suspended motionless in space.

"Speaking of the 'motionless' gondola," Dr. Briggs observed, "This Stratoflight developed the data which enabled us to plot with precision the ceiling for conventional propeller-driven aircraft—something soon of immense value to the air designers responsible for planning the combat armadas which were to win supremacy in global skies.

Unlike its 1934 predecessor, the 1935 gondola was equipped with a proplike fan on the end of an arm which was swung into place during the ascent's pause at 16,500 feet. Its purpose was to rotate the entire gondola-balloon system when desired. This was to facilitate observation and also to assist in temperature control by not having the same external surfaces of the gondola constantly exposed to the drenching brilliance of the sun.

"In the course of ascent," he continued, "the fan had been turned on at intervals and was effective in rotating the balloon. At the peak it proved useless. Steve revved it up to 5,000 r.p.m. but it failed to turn the balloon and gondola. The ammeter disclosed the faster the fan ran, there was a decline in the amount of power it required. The surrounding air was so thin the blades had nothing to 'bite' on."

Next the venerable scientists took up the subject of the odd thermal phenomena which materialized in flight. In anticipation of low temperatures during peak ascent the gondola's three drinking cans were filled with hot water and then wrapped in towels before takeoff. Sandwiches were carried for food.

After the 16,500-foot pause, Steve was seized with an over-powering thirst. Although he had eaten little in the previous 24 hours, he was not hungry but he had to have something to drink. To his surprise, he found the water in the cans had retained the same degree of heat as when it was put in them.

Hot water hardly makes the most tempting beverage in the world but once started he kept downing it. In approximately four hours intervening before the end of the mission, Steve consumed a gallon of water—an extraordinary amount for such a short interval.

In strange contrast with the water that stayed hot was the discovery that the sandwiches had frozen solid.

The temperature range inside the gondola varied from 43 to 21 degrees Farenheit. The men were warmly clad and at no time reported feeling uncomfortable. Exterior temperatures dropped from 2 below zero at 16,500 feet to 78 below at the peak.

The only thermal trouble to occur was the development of humid air in the upper portion of the gondola, causing frost to form on the glass of the dome port through which the men had to look to take readings on some exterior instruments and also keep an eye on the balloon. It got so bad observation became a two-man job. One would have his binoculars ready while the other quickly cleared the frost. In ten seconds the port would be thickly frosted again.

As in 1934, there was again the inversion of the temperature phenomenon existing in the gondola on the ground where the warmest part of the global chamber would be the upper portion since air rises when heated. In stratosphere altitudes, the gondola's upper portion was the coldest and condensing moisture gave it thin layers of ice. So cold was the surface, that the men avoided touching it. The lower walls of the shell, in contrast, were relatively warm.

### At the Top

"The horizon itself was a band of white haze. Above it the sky was light blue, and perhaps 20 or 30 degrees from the horizon it was of the blue color we are accustomed to. But at the highest angle the intervening bulk of the balloon permitted us to see it, the sky became very dark. I would not say it was completely black; it was rather a black with the merest suspicion of very dark blue."

This description is from an account written later by Steve, who was somewhat miffed that the balloon cheated him of a direct look at the zenith. The envelope blotted out all the sky above the angle of 55 degrees from the horizon.

"I am sure," he wrote, "that the sky would have been so dark directly overhead that we could have seen the stars at noonday . . .

"In the rigging hung a new flag of the United States . . . in full sunlight. I compared the blue of this flag with that of the sky. Now our regulation flag is quite deep in shade, but it appeared a much lighter blue than the blue of the stratosphere sky."

Color photographs Steve made at an angle of less than 55 degrees show Old Glory's blue strikingly lighter than the intensely dark blue skies beyond it.

At 1050 hours *Explorer II* reached the top. The men's feeling was one of sublime tranquility and any thought of danger, alien.

"Our impressions as we looked through a porthole toward the sun . . . were that it was a blindingly white disk of light, clear cut and sharp, against the dark blue of the sky," Steve related.

HEADQUARTERS, ARMY AIR FORCES
WASHINGTON

November 7, 1945

Dr. Gilbert Grosvenor, President
National Geographic Society
Washington 6, D. C.

Dear Dr. Grosvenor:

As you and I well remember, Sunday, Armistice Day, November 11, 1945, marks the Tenth Anniversary of the free balloon stratosphere flight which the National Geographic Society sponsored with the Army Air Forces, when the world's record of 72,395 feet was established.

Congratulations are in order on this occasion. We owe much to that flight. The contributions by your society, the scientists you interested in the pioneering effort, and the cooperation you gave the Army Air Forces bore fruit in World War II far in advance of what was imagined to be the results at the time.

We learned how valuable magnesium could be in the field of aeronautical design - for here was a metal lighter than aluminum yet stronger; and the trip where no man had been before proved the selection of the metal to be wise. More was learned about "pressurized cabins", two-way short wave radio communication, the use of electrically heated flying suits, and advancement was made in the little known field of aviation medicine. Many other items of equipment and methods were improved which later played important parts in giving American airmen superiority in the skies of Berlin and Tokyo.

As you rejoice in looking back on what your efforts accomplished, there is a point I wish to emphasize: That we must remember, at all times, that National Security depends almost wholly on the degree in which we - within and without the Services - keep abreast and ahead in the scientific and technological advances in military aviation.

During the war the whole scientific manpower of the nation was mobilized for the benefit of the Services, and a great portion of it for the Air Force. With the termination of the war it is incumbent upon all of us to make sure that ours is the most advanced Air Force in the world for none of us can lose sight of the over-all significance of what happened to Germany and Japan - any nation which lacks air supremacy is doomed.

Sincerely,

H. H. ARNOLD
Commanding General, Army Air Forces

**HAP'S TRIBUTE. On the 10th Anniversary of the triumphant Stratoflight, here's how General H. H. Arnold evaluated the great dividends which had accrued to the Nation as of that date. The dividends still accumulate.**

"Andy and Steve confessed to a big temptation at the peak," the Stratoflight's scientific director said. "It was to go higher. Dropping another thousand pounds of ballast would have taken them up beyond the 14-mile altitude. It was a great temptation, but these were true airmen. They were mindful that the vital function of ballast, so far as the safe completion of a mission goes, is its release during the return descent and, especially as the earth nears, to reduce descent speed and bring the gondola gently to a landing.

"They wanted to get everything back safe and intact this time. A careful tabulation of the remaining ballast gave Andy a margin to gamble with but he was taking no chances which might jeopardize full success."

Descent began at 1220. Before starting down the pair studied the far distant surface below. What did it look like? Here are Steve's words:

"The earth could be seen plainly underneath through the lower porthole and hundreds of miles in every direction through the side portholes. It was a vast expanse of brown, apparently flat, stretching on and on. Wagon roads and automobile highways were invisible, houses were invisible, and railroads could be recognized only by an occasional cut or fill. The larger farms were discernable as tiny rectangular areas. Occasional streaks of green vegetation showed the presence of streams.

"Here and there water could be seen in the form of rivers or lakes, especially if the sun was reflected from the water's surface. No sign of life on earth could be detected. To us it was a foreign and lifeless world. The sun was the only object that commanded our attention . . ."

With Andy valving off gas expertly, the descent was smooth and uneventful. Hatches were cracked at 16,000 feet and the men started releasing ballast and parachuting pieces of equipment to slow the rate of drop, then 700 feet per minute. By 3,000 feet the *Explorer II* was falling at the slower rate desired.

Several tracking airplanes circled the balloon. Below the men could see clouds of dust kick up in all directions as cars raced along the rural roads, converging on the probable point of landing.

The gondola touched the earth in an "egg shell" landing a split second after the two men pulled the rip cord which tore open the top of the balloon.

### Jackpot to Journey's End

"That was a moment of exultation for everybody," Dr. Briggs smiled. "They had made it, and made it safely. Secretary Dern and General Westover, who got the shortwave flash at the Geographic's headquarters, were delighted and so told Dr. Grosvenor who had been listening to reports with them.

"People had been following the balloon's final airborne minutes so closely that faces appeared at the gondola ports even *before* it touched down much to the airmen's consternation. In no time an amiable crowd of thousands ringed the gondola and scores of automobiles were temporarily abandoned in the vicinity.

"Several planes also landed on the flat terrain nearby. One piloted by Capt. James G. Haizlip, now a retired light colonel, carried Tom McKnew, the project officer who had taken off after the ascent began and followed the entire flight by air. He was among the earliest to press his congratulations on the happy pair."

*Explorer II's* touchdown was made some 12 miles south of White Lake in South Dakota, an airline distance of 225 miles from the Stratobowl. So ideal was the weather that a number of motorists who started out from Rapid City were able to keep the balloon in sight all during the flight. At the ascent's start the course drifted to the southwest, almost to the Nebraska border where it shifted to a generally northeast direction, veering southward again during descent with a final sharp turn to the north just before landing.

For the successful completion of their exceptional mission the two airmen were subsequently awarded Oak Leaf Clusters to their Distinguished Flying Crosses, won in the 1934 Stratoflight.

"And they richly merited all the other honors to come their way," commented Dr. Briggs. "Even before a start was made on the processing of

DECORATION OF DISTINCTION. The Hubbard Gold Medal, highly prized National Geographic Society award, is reserved for those in that elite company that have made the Explorer's Hall of Fame. Here General of the Armies John J. Pershing, a trustee of the Society for 21 years, presents Captain Stevens with a box containing his decoration while Captain Anderson holds the one previously given him. Dr. Gilbert Grosvenor, President of the Society, is on the left. In addition both flyers received the Society's Franklin L. Burr Prize Award of $2,000 cash for their specially meritorious work in the scientific exploration of the stratosphere. This was the second Hubbard Medal for Stevens, making him one of the very few to win the award a second time. He got it the first time for the 1934 Stratoflight.

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FOR AULD LANG SYNE. The Big Three behind the success of the 1935 Stratoflight clasp hands in a recent reunion alongside the gondola of *Explorer II* which set a space flight equivalence record on that mission destined to survive for 22 years. The men are (left to right) Dr. Thomas W. McKnew, Vice President of the National Geographic Society and Project Officer for the mission; Dr. Lyman J. Briggs, Director Emeritus of the National Bureau of Standards and Chairman of the Stratoflight Scientific Advisory Board, and Major General Harry G. Armstrong who, as a young captain, served as medical officer for the flight and later wrote the first professional papers on spaceflight equivalence problems. Reunion's scene is the National Air Museum at the Smithsonian Institution, Washington, D. C., where the Stratoflight gondola has a place of honor among other historic trailblazers in the annals of flight.

*Photo by S/Sgt. Theodore F. Gaidelis, Staff Photographer*

all the data they brought back we were quite confident it was a scientific jackpot, as the saying goes. The processing, some of which required many months, revealed what a phenomenal jackpot it was."

One of the most interesting early results was the discovery that air samples taken from altitudes of 36,000 feet up contained microorganisms and bacteria that were able to survive in a state of suspended animation in an environment so hostile that previous scientific belief held no life could exist in such conditions. When these organisms were taken to an Agriculture Department laboratory, given the right temperature and placed in a nutrient solution, they soon resumed normal growth and reproductive processes.

"A highly dramatic addition to our knowledge," exclaimed the elderly scientist. "It gave us an explanation of how this infinitesimal form of life can be picked up by natural forces from one country or continent and migrate to another thousands of miles distant. We could understand how molds which cause plant rot, normally confined to tropical regions, may under favorable weather conditions suddenly appear and ravage the crops in a temperate land. The same holds true for bacteria which cause disease in animals and man."

Other important advances singled out by Dr. Briggs were those that came from data on the chemical composition of the atmosphere, its electrical conductivity, the vertical distribution of atmospheric ozone above 52,000 feet; measurements on the brightness of the sun, earth, and sky; wind velocity and variability; temperatures and pressures.

"One of our biggest interests, of course," Dr. Briggs went on, "was the results of cosmic ray research. You will recall that in 1934 only 50 percent of this data was salvaged after the gondola crash.

"It was a grandly different story this time, complete success."

He described how instrument counts established that cosmic rays traveling vertically toward the earth —the most numerous to reach the surface—increased in number to a maximum of 51 times their rate at sea level when the altitude of 57,000 feet was reached. From there to the top of the ascent the number of rays decreased, the ratio at peak altitude being 41. This substantiated the theory that the original high velocity, subatomic particles—known as primary rays—are stripped of much of their enormous energy in transiting the atmosphere. During this process, involving collisions with air molecules, the primaries are transformed into weaker secondary, tertiary or lesser rays before ending their descent.

"Another highly significant finding is that rays traveling in a horizontial direction, a rarity near the surface, rapidly increased in number with altitude. At 40,000 feet the count was one horizontal ray for every five traveling vertically and by 72,000 feet the number of the two varieties had become substantially the same.

"Data were also compiled on rays traveling in other directions, for they come from all points of space."

There was still satisfaction in his voice after all these years when he spoke of the mission's obtaining the first track ever made directly in the emulsion of a photographic plate by a cosmic ray of an alpha particle type having the enormous energy of 100,000,000 electron volts. A companion first was the recording of bursts of energy generated from molecular atom's disruption under the bombardment of cosmic radiation. He also cited the value to biology from the subsequent laboratory study of fruit flies (Drosophila) exposed to the radiation for the purpose of learning something about the genetic changes produced in the insects which they would pass along to future generations in breeding.

Considering his familiarity and preoccupation with the atomic and subatomic world back in those days, it is not surprising that when a portentious decision was made in the critical spring of 1941 FDR was to note: "I appointed a special committee, with Dr. Briggs of the Bureau of Standards as chairman, to study the possible relationship to the national defense of recent discoveries in the field of atomistics, notably the fission of uranium . . ."

Following my sessions at the National Bureau of Standards I saw Dr. McKnew one afternoon in his offices at the Geographic and he had some interesting footnotes to round out this epic story of flight.

"Bill, Dr. Briggs laid out for the

**STILL IN BUSINESS.** Since the pioneering Stratoflights of the mid 30s, the Black Hills Stratobowl has been the launch place for other missions to explore extreme altitude conditions and phenomena. Here on a snowy November night in 1956 final preparations are being made for the launch of the Navy's *Stratolab* project ascent which reached an altitude of 76,000 feet to better the long-standing record of 72,395 feet set by *Explorer II* in 1935. The spherical gondola differs little in appearance from its prototype of almost a quarter century earlier.

*Official U. S. Navy Photo*

Stratoflights a scientific program that was far ahead of world thinking at the time, so profound was it in conception," he said. "We have come to appreciate this in the perspective of today. However, it will remain for the ultimate evaluation of tomorrow or the day after to assay the magnitude of all the dividends stemming from the program."

"Three years ago," continued Dr. McKnew, "he happened to be in Flagstaff, Ariz., and met Col. David Simons, then a major, who last August made the 32-hour 'Man High' flight to a new altitude of 102,000 feet."

Simons waxed eloquent about the immense value of the two volumes of scientific papers on the Stratoflights, contributed by experts in various fields and published by the Geographic in the '30s.

" 'When we began to contemplate space after World War II,' " Dr. McKnew quoted Simons as saying, " 'these were all we had to go by, yet they covered practically the full range of the important basic concepts we needed.

" 'Do you wonder we have come to look upon those books as our bible?' "

After recounting this episode, Dr. McKnew leaned forward and, speaking with deepest earnestness and conviction, gave me his own assessment of the Stratoflights.

"Since its founding in 1888, the National Geographic Society has sponsored more than 150 expeditions and research projects in numerous scientific fields.

"I say to you now that this one, the *Explorer* flights, is far and away the most profitable one in terms of scientific yield that we have undertaken."

That, to me, was an unexpectedly strong statement, to accord the Stratoflights peerless place in the glittering galaxy of scientific achievements the society has wrought in the past 70 years. Frankly, I had not expected such a pronouncement, particularly from Dr. McKnew because he is always on the conservative side in speech and not given to sweeping statements.

Perhaps my expression betrayed some of my surprise at the verdict he had uttered, for what he said next pointed up the whole purpose of basic research concisely.

"For too many years past we have had the importance of 'know how' emphasized almost exclusively," he declared. "Now, I believe, there is a great awakening to the obvious that to develop 'know how' one must first possess the 'know why.'

"The Stratoflights were the richest 'know why' endeavors."

## THE CASE OF THE VANISHING LONGJOHNS

Pioneers have been known to lose their shirts, but Capt. Albert W. Stevens contended he was the first to lose his underwear—two suits of it.

This unique bit of larceny occurred as a postscript to the 1934 Stratoflight which ended when the crew bailed out of their gondola after a hydrogen explosion destroyed its balloon. When the men hit the dirt of a Nebraska farm that August afternoon, the mercury was hovering around 100 degrees. This was roasting for Steve, who had two pairs of longhandled winter underwear under his canvas flight suit for the low temperatures at high altitude.

Battling his way through hordes of frantic souvenir hunters converging on the wrecked gondola, he repaired to a nearby farmhouse. There he shucked his sweat-soaked woolies, got back into the flight suit, then went outside and draped the longjohns on a fence to dry. No one was about and he returned to the farmhouse to make a phone call.

Emerging in a few minutes, he was astounded to discover the dainty lingerie had vanished. Was he browned off! "I haven't seen it since," he lamented long afterwards. Presumably it had been stolen and cut into small squares by frenzied souvenir hunters. At times Steve wondered whether, like pieces of the shreded balloon fabric sent to him by mail for autographing, he also signed his name lots of times on scraps of his own underwear.

# IN MEMORIAM

1894 - 1958

APPROVED APRIL 1942
ARMY AIR FORCES
SHOULDER PATCH DESIGNED
BY JAMES T. RAWLS
ART CHIEF AAF

OFFICIAL FLAG OF GEN. H. H. ARNOLD
DESIGNED BY JAMES T. RAWLS, ART DIR. A.A.F.
APPROVED JUNE 1943
GENERAL
COLONEL

On June 20, Jim Rawls, the beloved Art Director of The Airman, died in his office. Jim's association with the Air Force spanned many years and achievements. In 1941 he joined the Department of Public Relations of the Army Air Forces. In that capacity he designed the original Air Force shoulder patch which was personally approved by General H. H. Arnold. He later designed General Arnold's official flag.

In the meantime he served as the first Art Director for *Air Force,* the Official Service Journal of the U. S. Army Air Forces. When an official journal was reactivated in 1957, Jim became its first Art Director, bringing to it almost 40 years of professional artistry, and a veteran's experience from World War I.

Just prior to his death, Jim had planned to give the original art work of the shoulder patch and flag, autographed by General Arnold, to the Arnold Room at the Air Force Academy. It seems an appropriate shrine.

*I read the Airman*